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EDITORIAL NOTES—GAS, &c.

Death of Lady Livesey—The Memorial Fund.

PARTNER of her late husband for about fifty years, Lady Livesey has only been separated in life from him by some three months; in spirit, the two lives were never sundered. Her death occurred last Friday at Reigate. Lady Livesey was in every sense a true partner—in the successes of her husband she rejoiced; his sorrows, cares, and anxieties in all the interests that occupied his busy and valuably useful life, she shared with him. No one can tell how great was the balancing and the palliating influence that the wife, in the affairs outside the domestic circle, brought upon the strong and active mental power of the husband, whose restless nature was always desirous of seeing execution following rapidly upon conception. In the humane work of his life, Lady Livesey was profoundly interested. Time was, before physical suffering prevented, that she used to be personally present, at the Old Kent Road works' recreation ground, on what was then known as "Bonus Day." Ever afterwards, though compulsorily absent from them, in her heart the men, wives, and families of the two Companies of which Sir George was the head, held a large part. We never remember an address to the men of the two Companies, when accompanied by their wives, in which the late Chairman did not acknowledge how much his happiness, success, and joys in life were due to the interest, the sympathy, and the counsel of his wife in all to which he put his hands. For many years Lady Livesey has been more or less an invalid; but, strange to say, just before Sir George's death, her health and strength improved to a degree that surprised her immediate friends. It seemed almost as though an unseen power prepared her for the great blow that was soon to fall upon her tender and affectionate heart. The brevity of the life-separation of the two touches those higher emotions that have their seat in the soul of all who can be characterized as human beings. With the death of Lady Livesey, the benefactions (under the provisions of the will of Sir George) of which full particulars have already appeared in our columns will have an almost immediate effect.

Regarding the Livesey Memorial Fund, it will be seen from the statement of contributions up to yesterday that the total sum so far received amounts to £1321 13s. 6d. But this represents only a few undertakings, firms, and personal subscribers; the great body of the gas industry—undertakings, firms, directors, officers, staffs, and others constituting its major part—has yet to respond. There is some question as to the amounts that should be subscribed. Mr. H. E. Jones makes a suggestion in our "Correspondence" columns on the subject. But in regard to it, we should be sorry if any directors and others adopted any hard-and-fast rule on too low a scale in such a matter as this, as it is sure to be found that there will be directors and committeemen, of the parsimonious and unsympathetic types, who will show a closed hand in this matter. Regarding contributions from kindred industries, and sympathizers with the work of Sir George in the labour world—a matter on which we touched last week—it is seen that an appeal has been made, in the form of a letter in the Daily Press. It is hoped that this is being supplemented by the more direct method of well-placed personal communications in a few hundred likely quarters. A suggestion was also made in last week's issue to the assistants and junior members of the staffs of gas undertakings, manufacturing firms, and others, in order to give an opportunity of contribution to the fund in a manner that will enable every such contributor—no matter how small his contribution—to have some personal association with the fund. The originators of the fund desire that, by the spread of contribution throughout the industry, it shall be truly representative of all sections of the profession. We therefore ask assistants and juniors on works and firm staffs to consider well the proposal put forward last week. It is open for any member of a works' staff to take up the matter within the sphere of his daily avocation. The Midland Junior Gas Engineering Association previous to our reference to this matter had already started a fund among their own members; and a circular has now been sent out by the Hon. Secretary and Treasurer (Mr. Harold E. Temple) regarding the matter.

Revival of Purification by Means of Ammonia.

THE years 1885 and 1886 witnessed the promulgation by several active workers of schemes for the purification of coal gas by means of caustic ammonia, derived, in the first instance, as a bye-product of the manufacture of the gas itself. For example, in 1885 Mr. William Young obtained a patent for an apparatus and process embodying such a scheme, of which more will be said anon; in June, 1886, Mr. C. F. Claus obtained a series of patents for a process for the purification of gas by means of causticized liquor, which became well known under his name; and a month or so later, Mr. John Hammond also secured letters patent for a somewhat similar process to which reference will also be made later on. The interest shown at that epoch in these and earlier schemes for the same purpose is reflected in the admirable series of articles by Mr. Lewis T. Wright, which were published in the "JOURNAL" in 1886. It is worth while noting at the present time that this distinguished gas chemist saw no sufficient reason, from the chemical and thermal standpoints, why a scheme of purification by the use of liquor should not be successful. As a matter of fact, it is not on principle that such schemes have hitherto failed, but by reason of faulty design, construction, or manipulation of the apparatus adopted. In saying this, we do not reflect disparagingly on those responsible for the early schemes and attempts, for the practical difficulties in the way of attainment of success are admittedly manifold and severe. But the fact that there is clearly no inherent impossibility of success must be held responsible for the recent revival of interest in the purification of gas through the agency of causticized liquor.

Rumour has it that one scheme of this nature has been on trial for some time past at one of the London Gas-Works, and that promising results have been secured. Then, again, we gather that one of the patentees of the 1885-6 era—viz., Mr. John Hammond—is giving attention to liquor purification in conjunction with his experimental gas-making plant at Eastbourne. Of the experiences gained in these and other instances, detailed information is not yet available for publication. But, by a happy coincidence, the interest in purification by the use of causticized liquor which has been aroused by the rumours of trials and progress made at certain works, will be sustained and whetted by the communication of the late Mr. William Young which appears on another page of to-day's "JOURNAL." In directing special attention to this valuable sequel to his communication on the "Gasification of Coal" which was published last week (*ante* p. 17), it will be well to point out that the scheme of purification outlined in it is not necessarily subordinate to the scheme of gasification referred to. It is applicable to the purification of coal gas made in the ordinary way, though, undoubtedly, it should achieve success more readily with gas containing a greater proportion of ammonia than normal crude coal gas. Consequently, while peculiarly adapted for use conjointly with the gasification process, of which one of the objects is to secure a greatly enhanced yield of ammonia from the coal gasified, it should also work successfully on coal gas as now made. In the first place, it may succeed where other allied processes have failed, because, as Mr. Young has aptly put it, it accomplishes in two pieces of apparatus, with one single pumping of the ammoniacal liquor while cold, that for which the Claus process, for instance, employed from six to ten separate pieces of apparatus, with pumping of the liquor (sometimes heated and partially

causticized) as many times. Secondly, Mr. Young has proposed to take advantage of the greater solubility of ammonia —in common with other gases—in water when the pressure is increased, in order to obtain greater concentration of the resultant solution of caustic ammonia, and greater rapidity of working. Finally, Mr. Hammond has contributed his experience with his early scheme for the partial purification of gas by means of caustic ammonia obtained in conjunction with the manufacture of sulphate of ammonia. To what extent advantage is taken of each of these ideas in the final Young and Hammond process is not quite clear just at the moment of writing; but we may appropriately quote from the article Mr. Young's own words in regard to it: "The "essential novelty consists in carrying out the previously "described processes by new arrangements of apparatus "and methods of operating them, by which the principle "of regeneration is as fully as possible applied, and the heat "and mechanical energy used in the process as far as pos- "sible utilized in doing useful work."

Few technical schemes would now be commercially successful if restricted for their exploitation to the "arrange- "ments of apparatus and methods of operating" which the knowledge of 1885-6 could have disclosed; and it may well be that a scheme, admittedly sound in principle, which failed from the commercial standpoint at that time, may, by the application of more modern and economical plant and modes of working, now achieve success. For this reason, there is hope in the present revival of interest in the purification of gas by means of causticized liquor. The late Mr. William Young at least could testify from intimate personal knowledge that but for the technical advances of the past twenty years or so in apparatus and methods of operating, the shale oil industry of Scotland would have been practically extinguished. Since these advances have served to preserve and renew the vitality of this one industry, it is not impossible, nor improbable, that they may, when applied to another industry in respect of a process as sound in principle as that of the purification of gas by the causticization of liquor, imbue that process with life and vigour. At least, we may be reminded, by a perusal of the lucid exposition of the causes of past failures and the directions in which success may most hopefully be sought which the late Mr. Young has bequeathed to us, that there is no substantial ground for putting aside purification by ammonia as wholly impracticable.

Dangerous Disused Underground Sewers.

An inquiry has been opened by Dr. F. J. Waldo on the second little victim of the Bermondsey gas explosion, the primary cause of which was the bursting of a water-main, which washed the support away from a rider gas-main; but the investigation has been adjourned to enable Dr. Waldo to have before him some expert evidence. This second inquiry, although it has not proceeded far, has given particular emphasis to one matter concerning the conditions existing in subterranean London; and it is a subject that should receive the serious consideration of our local authorities. It is as to the imprudence, under modern conditions, of allowing the continued existence of old disused sewers. These offer very convenient storage, as is shown in this case, for any gas that may by mischance escape from the distribution system; and not only so but, again as in this instance, they make the trouble of locating gas leakage all the greater by supplying a channel for the free distribution of the gas. Should there be accidental ignition, disastrous and even fatal effects may be scattered far and wide. At this second inquiry, Mr. W. G. Gamble, the second in command of the London Fire Brigade, told Dr. Waldo that in the road there was an old sewer, that three of the explosions occurred where there were side entrances to the sewer, and that the broken gas-pipe was immediately over a brick shaft, which, according to the plan produced, communicated with the old sewer. If this abandoned sewer had not been in existence, it is easy to conceive that the effects of the damage caused to the gas-main might have been circumscribed; and it is quite possible the escape would have been detected and rectified without an explosion at all.

There has been reference in the foregoing to the modern conditions of subterranean London. We know that gas-pipes and electrical cables in London and elsewhere have not had an altogether happy association as neighbours. It is impossible with a gas system, and the amount of vibration and disturbance to which the pipes—particularly in London, with its present rapid and heavy surface and underground traffic—are subject to prevent a moderate percentage of leakage; but electric culverts and boxes have in the past given harbourage to that gas, and assisted in its accumulation, and (say) a short-circuit has done the rest. Old sewers and deteriorating electric cables will not in future make the conditions of underground London any the more comfortable, nor add to the felicity of those who have to use the surface. We are not making here any suggestion that there was electrical ignition of the explosive mixture in the derelict sewers in Grange Road. No evidence to justify it has been forthcoming. But we do say that, now more than ever, abandoned sewers should be either destroyed or filled in, so as not to afford means for the accumulation and distribution of an explosive gaseous compound. As was pointed out last week, there has been no satisfactory clearing up yet of the question of how the gas on this occasion became ignited at all points of explosion. There was a night watchman's fire in the road; and there were the danger lamps in connection with the road work that was proceeding. These were all on the surface of the road. The evidence is contradictory as to whether the explosion was accompanied by fire; but one witness has stated that he saw fire coming up through one of the gratings. We do not know whether the further evidence adduced before Dr. Waldo will assist in elucidating the matter. But it is hoped that it will.

Fire Insurance Companies as Canvassers.

A correspondent, "T. B.," this week calls attention to some activity in gas supply districts under his care on the part of certain fire insurance companies, or their representatives, in acting (so to speak) as canvassers for the electric light. In the districts in question, several valuable customers have been lost through this. At the present time "the "Liverpool and London Insurance Company are pressing "the proprietors of a large mill to put in the electric light;" and one of the Company's inspectors recently told the mill-owner that "all the best mills are now using this light." On this point, our correspondent asks for information as to whether the experiences of other gas engineers confirm the statement of this insurance inspector. There will be pleasure in publishing such experiences; and, at the same time, perhaps correspondents will tell us whether this activity on the part of the Insurance Companies or their representatives has reached their districts. We have not had information of it before, so probably it is purely confined to the localities in which "T. B." is interested. If this could be proved, it would seem to indicate that it is not the fire insurance companies who are acting as agents for the electricity suppliers, but that their servants are doing a double business, or are unduly influenced by interests of another kind or personal predilection. This is a point on which we confess to total ignorance. If, however, canvassing is being done for a consideration by fire insurance inspectors without the knowledge of their superiors, then it would be of interest to know the terms upon which such agency is carried on; for we imagine an electricity supplier cannot with impunity offer an insurance agent (without his employers' consent) a reward for obtaining business from a person with whom that agent's company have transactions, and obtaining that business to the detriment of the electricity suppliers' trade rival. This is a point upon which the second part of an article, by Mr. V. R. Balfour Browne, that appeared in our issue for Feb. 25 last (p. 475), has some bearing. However, such a method of doing business would not in the long-run bring credit upon the electricity suppliers, nor is it a business that most reputable insurance companies would allow their inspectors or servants to be mixed up with.

"T. B." does not suggest that it is the paid agents of certain Insurance Companies, but that it is the Insurance Companies themselves, who are pressing these particular millowners to adopt electric lighting to the injury of the gas suppliers. It is not the business of the Insurance Companies to advise their clients as to the system of lighting or power to be adopted. Their business is to insure; and to see that what they insure is made as secure as possible by the best work in its class. We shall be glad to learn the truth of the matter—as to the extent (if any) of responsibility in their corporate capacity—from the Liverpool and London Fire Insurance Company (this being the concern specially named), and from gas engineers and others as to whether they have had any similar experiences with this or any other insurance office. If there is confirmation, then it

will be for gas-works boards and committees, and gas share and stock holders, to say that Insurance Companies must desist from the use of their position to injure the gas business, or there must be a transfer of insurance business to quarters where there is no interference, or active one-sided operations, in the competition of external trades.

Our correspondent, we repeat, asks for the experiences of readers. To the rebutting information that it is hoped he and others will secure through this allusion to the matter, "T. B." can add some particulars as to the experiences of the Chief Electrical Engineer of the Phœnix Fire Insurance Company regarding electrically caused fires, by reference to our "Electric Supply Memoranda," notably on Dec. 15, p. 754. The last annual report of Mr. Michael Longridge, the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, also affords, as references in the "JOURNAL" have shown, some information as to the relative rates of breakdowns in electrical motors and gas and oil engines. Another shaft for "T. B.'s" quiver is supplied this week by the "Electrical Times," in dealing with the question of insurance and electrical fires. We read—

Supposing a man with an electrical installation, duly approved by the fire office, gets an accidental short-circuit, which starts a fire, which destroys his electrical fittings, he will usually find that he runs up against a clause in his agreement with the fire office to the effect that the office is exempt from paying for any loss or damage occurring to his electrical fittings due to a fire originating within such apparatus or fittings. Thus, from a recent issue of the "Royal Exchange Assurance Magazine," one learns that not only are the proprietors of dynamos, motors, and cables which commit igneous suicide, disqualified from collecting the insurance money under a special clause, "but whether the [special] clause be inserted or not, the companies repudiate liability for loss or damage to the apparatus itself caused by self-ignition, as they contend this is not loss, or damage, within the meaning of a fire policy. But assume that an office covers 'fittings' among other things in some risk, *the power being derived from an outside source*, and the wiring fuses or the switchboard is damaged, it may be that exceptional argumentative qualities will be required before one can convince the insured that damage to the fittings themselves is a special risk, and not included in the policy."

The main points, however, raised by the letter of "T. B." are as to whether his experience is a common one, and as to whether the insurance inspector's statement is generally substantiated, that all the best mills now use electric light.

An Unheeded Warning.

ONE of the most singular stories of unheeded warning in connection with a gas escape is that told by the daily papers on Tuesday last of a gas explosion and fire at a mansion at Hayes, Kent. The occurrence evoked much publicity and attention from the fact that the fire involved the destruction of a wing of the house and some fourteen valuable motor cars; and the damage is variously assessed by the newspapers at anything between £20,000 to £40,000. If there is one advantage in the matter of safety that gas has over electricity, it is that it makes any escape from the control of the pipes noticeable by smell; while electricity gets to the actual fire-raising stage before there is any knowledge of danger. In this instance, the occupants of the house make no secret of the facts that they had had plenty of warning of the escape of gas, that they had allowed it to continue and continue until it got to such an unbearable pitch that then, and not till then, did the owner turn off the supply. The explosion, too, indicates that he had not—in the presence of what his very act in going to turn off the gas at the meter away from the house showed he recognized to be a danger—had the whole of the lights in the place extinguished. According to a story of the fire, as stated to have been related by the owner to an "Express" representative, he said: "For some time we have had a bad escape of gas; and "I have been arranging to have it attended to." Another morning paper asserts that the presence of escaping gas had been observed for a week previously. Again, "on Satur- "day night, the smell of gas was so dreadful that my wife "telephoned to the Fire Brigade." Why the Fire Brigade, and not the Gas Company? Then on Sunday, so alarmed were all the occupants of the house that the owner sat up all night, because, according to the "Daily Telegraph," "we "were all afraid something might happen." Then the explosion occurred while he was away at the gardener's cottage turning off the supply of gas. The act had been deferred too long. The meter is situated some 80 to 100 yards from the house; and at that point ends the Bromley Gas Company's connection with the service to, and the gas arrangements of, the house. There was a gas explosion at the house some four years previously; and therefore the danger should have been accentuated by the prior experience. The reason given for the delay in having the leakage remedied is that the local plumbers were busy over the epidemic of frozen water-pipes. But a mansion and an escape of gas that caused such apprehension were surely as important as frozen water-pipes! There was, too, the meter-tap standing between warning and disaster. And last, but not least, if the local plumbers were so frightfully harassed over frozen water-pipes, there was the Gas Company. While the Fire Brigade, the newspapers tell us, were communicated with on the Saturday night before the explosion and fire occurred, the services of the Gas Company do not appear to have been solicited. The disregard of warning has had a lamentably destructive effect on this occasion.

Warning the Shareholders.

In view of the fact that the Gaslight and Coke Company have lodged an appeal in the matter of the supply of shareholders' lists to company promoters or their agents who are holders of shares or stock, gas companies will naturally decline to accede to requests for lists pending the decision in the Appeal Court. But meanwhile it must not be forgotten that these company promoters have already in their possession valuable lists of share and stock holders in sound gas undertakings; and it is among those whom they have not already succeeded in entrapping as subscribers for shares in their promotions that they are more likely to do business in future than among those who have already put money into their concerns, and have found out their mistake. Both through correspondents and editorially in these columns, it has been suggested that the value of the lists of shareholders to the promoters of concerns floated primarily and mainly for putting money into the pockets of their founders, can be largely neutralized by issuing a warning to holders of shares or stock in old-established and sound concerns. The Tottenham and Edmonton Gas Company have adopted this course; and the wording of their circular is as follows:

Dear Sir, or Madam,—The Directors think it right to warn you against subscribing capital for certain new companies (usually "Limited") that are being promoted from time to time, with the object of supplying gas, &c., to some of the villages and smaller towns in the rural districts of the country. The prospectuses of these ventures are being sent broadcast amongst investors, and particularly to shareholders in existing dividend-paying gas and water companies. Before subscribing to any company answering the description given, you are advised to make careful inquiries from independent persons connected with the gas industry. Some of the companies referred to are probably *bond-fide* concerns, but others are purely speculative.

The circular is couched in modest terms—much stronger ones could have been employed. But it is sufficient for its purpose. Other companies are, as will be seen by a letter in our "Correspondence" columns, following the same excellent line of action. From the same letter, it will be gathered that the terms of the above circular have been approved by a member of the Bar of high standing.

Public Misstatement.

There is a need at the present time for more local councillors of keen perception, and who are capable of exercising care in their statements at the Council meetings. There is an all too frequent carelessness and looseness in the manner of expression, which has the effect of misguiding and deceiving the public. We will admit that sometimes—and this is not always the reporter's fault—local councillors may be misreported, and so be made the authors of strange and foolish assertion. Whether it was looseness on the part of the speaker, or whether it was the reporter's fault, we will not go so far as to declare; but, in the report of the meeting of the Finchley District Council published in last week's issue, Mr. Royston, the Chairman of the Highways Committee, is credited with saying: "The Engineer to the City of London had said that, light for light, high-pressure gas cost four times as much as electric flame arc lighting." Now *the* Engineer to the City of London is Mr. Frank Sumner, M.Inst.C.E.; and he desires it to be known far and wide that he has never been guilty of the statement. We can well understand that Mr. Sumner has no desire to be the reputed author of such a piece of gross absurdity. It was the Electrical Engineer of the City of London (Mr. A. A. Voysey) who, in a now famous report which has not had much

weight with the City Corporation, made the assertion ascribed to the "Engineer of the City." But that was not the only statement at the Finchley meeting that was contrary to fact. There were references to 3000 and 2000 candle power flame arcs! Are the Council satisfied that these lamps will give anything like the illuminating powers nominally credited to them? We assert that, including capital charges for the lamps and work incidental to installation, the cost of electricity, carbons, labour, and repairs, flame arc lamps of the so-called 3000-candle power cannot be supplied at £20 per annum, nor lamps of 2000-candle power at £18. Competition for public lighting at the present time has the tendency of making flame arc candle powers ascend in imagination, and the costs put on the table to descend. The way that some councillors set the interests of the ratepayers (the greater number of whom are gas consumers) in the second place and those of the electricity undertaking in the first place was instanced on the the same occasion by Mr. Beggen, when he argued that it would be "playing ducks and drakes" with all the capital sunk in the electricity undertaking if they were now to revert to gas. It is a pity that councillors forget that the interests of the electrical undertaking form only a small part of the interests entrusted to their care.

Sulphate of Ammonia Market.

A perusal of the excellent review prepared by Messrs. Bradbury and Hirsch of the market for sulphate of ammonia during 1908, leaves one with the impression that the difficulties of the reviewer are increasing year by year, by the accumulation of factors that influence the market for good or ill. Prognostication as to the probable trend of events becomes more and more troublesome; and explanations as to transpired events become considerably more perplexing. Uncertainties of position, past, present, and future are in evidence throughout the review. The increasing sources of production in this country and abroad, the varied influences affecting old and new sources, the competition between country and country, the current and future policy of producers and dealers in various countries, the movements of orders in what may be regarded as the permanent trade in the commodity abroad, the fugitive requirements of foreign countries, added to the conditions of the world's trades generally, are, though not the sum-total, of the factors that prevent the reviewer from speaking with greater decision than he does. But the review would be greatly missed if not forthcoming; it is the nearest approach to accuracy for guidance as to the influences of the past and as to prospects that experience in an exceptional position in sulphate of ammonia commerce can give. With the keener competition between country and country for export business, and the increasing efforts made on behalf of nitrate of soda, the necessity, it may be incidentally remarked, grows for the efficient maintenance of the work at home of the Sulphate of Ammonia Committee.

Prices and Prospects.

Considering all the conditions of the year, there is cause for thankfulness that the price of sulphate of ammonia did not fall lower than it did; but there can be little doubt that, had it not been that (as is firmly believed) the German dealers abstained from marketing part of their production, the average price for the year would have shown greater shrinkage. The estimated home production of the year kept very much on the lines of 1907, so that production could not in itself have influenced the market. The general depression in trade, and protracted strikes in the North, and the mild weather, have been antagonistic to gas production to such an extent that there will not be surprise if Messrs. Bradbury and Hirsch's estimate of a diminution of 1500 tons in the production of sulphate of ammonia from gas-works is not somewhere near the mark. Iron-works, too, show a recession of 1000 tons; but coke and carbonizing works and producer gas have to their credit a calculated additional output of 3500 tons, the reason for which, in view of trade conditions, is not very clear, though admittedly the yield from these sources has been going up by leaps and bounds since 1903, when it was only 27,500 tons, compared with the computed 79,000 tons last year. However, taking Hull f.o.b. average monthly prices for last year, the falling away is as between £11 16s. 3d. in January, and £11 0s. 4d. in December, though, owing to the maintenance of prices above £12 in March, April, and May, the average for the year comes out at £11 12s. per ton. But this figure, f.o.b. Hull, is the lowest since 1901, though only 3s. 8d. less than the average for 1907. In 1907, however, there was not the severe disparity in the average monthly prices that was witnessed in 1908. Considering all things, there is cause for gratification that prices were no worse. The signs suggest that expectation should not be pitched above the results of the past year. If the suspected stocking by Germany is true, the effect must be felt in the immediate future, as the prospects of trade improvement are not great, and sulphate of ammonia production is likely to continue at the level of the past year, during which the German abstention from full selling has been taking place. The probable demand from abroad this year at the moment is very much a matter of surmise; and the conditions of the nitrate market are such that prices there are likely to show a continued low level. There is not, therefore, much on which to batten hope with regard to an immediate improvement in the sulphate of ammonia market; and the present view should be that there must be satisfaction if 1909 comes out no worse than 1908.

Automatic Street-Lamp Lighting in Liverpool.

Those of our readers who are considering the advisability of adopting automatic controllers for the public lamps in their districts will doubtless read with interest the extracts given in another part of the "JOURNAL" from the report of Mr. A. G. Smith, the Superintendent of Street Lighting in Liverpool, on the use of these appliances in the city. As the result of trials of various controllers, the Lighting Committee sanctioned the purchase of 250 in addition to the 22 already in use experimentally; and in November, 1907, they were fixed in different thoroughfares, in positions specially chosen to subject the lamps to the severest wind pressure and strain. By means of the controllers, the lamps are gradually lighted; the operation taking about twenty minutes. It was feared that, owing to the varying temperature and the heavy traffic, the number of stoppages would be great; but, as a matter of fact, they averaged only 16½ per month. This was considered highly satisfactory. At the date of the report, the system had been in operation rather more than twelve months; so that from the experience gained the Superintendent was able to form a definite opinion as to what would be the result of its application over the entire district. Very careful records were kept in regard to each controller, burner, and lamp; and the total maintenance charges for the 272 lamps in use came to £140 12s. 4d. The average charge per lamp therefore works out at 10s. 4d., while that for the existing type of lamp amounts to £1 9s. 2d. The Superintendent indicates the various ways in which the adoption of the controllers will effect savings, and emphasizes the fact that one of the chief features of the new system is that the lighting-up will be practically instantaneous. If applied to the city at once, the system would involve a net capital expenditure of £37,250; but Mr. Smith recommends that it should be installed at the rate of about 4000 controllers per annum. The result of the presentation of his favourable report is that he has been authorized to spend £1875 in completing the equipment of a portion of a district with automatic controllers.

A Change of Mind at Belfast.

It was stated in the "JOURNAL" recently that, subject to the approval of the Council, the Belfast Gas Committee had appointed an Engineering Assistant for temporary work in connection with the projected extensions of the gas undertaking. When it was proposed in the Council to insert advertisements asking applications for the post, it seems that not a single voice was raised against the course, which was therefore adopted. There were over twenty candidates; and of these the Gas Committee selected four, and asked them to attend a meeting at Belfast, so that a final decision could be come to. This they did; and as the result, a gentleman from Glasgow was selected. It might have been thought that this would conclude the matter; but any such assumption would have been incorrect, for when the appointment came before the Council last week for confirmation a long discussion took place, at the end of which the Chairman of the Gas Committee expressed his willingness to take the recommendation back for further consideration. This is excellent as a demonstration of the truth of the old saying that "There is many a slip 'twixt the cup and the lip;" but when the matter is considered from a business point of view, it does not appear to be so satisfactory. The report of the discussion which is given in another

column certainly indicates a wide divergence of views; but, with the Lord Mayor, one must wonder why all the objections to the appointment now put forward were not raised at the most convenient time—namely, when the proposal was made to insert the advertisement. Various persons have been put to a great deal of trouble—needlessly, it now appears; and if nothing more should come of the matter, the four candidates who attended before the Committee at their request would, at any rate, seem to have a real grievance against the Council. The Lord Mayor did not mince matters when he said that by sending the recommendation back the Corporation would be stultifying themselves; but his remark will strike many people as being not a bit stronger than the circumstances warranted.

The Publication of Contract Terms.

It was by no means a new subject that the Salford Town Council had before them at their meeting last week, when they discussed the advisability or otherwise of publishing the terms of contracts and all special trading agreements in the synopsis of the different Committees' proceedings, or on the *agenda*, before acceptance by the Council. It is a point that has often before given rise to differences of opinion; but really there does not seem to be any reason why, if municipalities are to go in for trading businesses, they should not govern their proceedings by the same considerations that are usually held to apply to ordinary commercial undertakings. Shareholders in private companies have to place a great amount of confidence in the directors; and therefore ratepayers and councillors generally would not be without precedent if they relied upon the members of their committees to do the best they possibly could for the business under their charge, without the details of every step taken being made known outside. However, as it has been decided to appoint a Special Committee of the Salford Town Council to consider the whole question and report thereon to the Council, we have no desire to prejudge the matter. The settlement of the subject one way or the other has been deferred for two months to allow of the Committee's report being submitted; and we shall await this document and the Council's determination with some curiosity to see whether or not the latitude hitherto allowed to the trading committees in the matter of giving or withholding details concerning their undertakings is to be withdrawn.

The Accounts of Borough Councils.

There will be found in another part of to-day's "JOURNAL"—the first number published since their issue—some figures relating to the accounts of the Councils of Boroughs other than Metropolitan Boroughs. When compared with previous similar compilations, the growth of the incomings and outgoings of the municipalities can be gauged; but it must not for a moment be imagined that the condition of affairs which is set forth in to-day's "JOURNAL" is precisely that existing at the present moment. By no means—for the statistics which are now for the first time available deal with the year 1905-6. The enormous amount of labour involved in securing and collating the prodigious amount of information that is presented in statistical Blue-Books of this character, is brought home to one by the most casual glance over the contents. But, even so, on taking up the volume now before us, the thought will obtrude itself that the information to be gleaned from it would have had its value much enhanced by more prompt publication. However, that it was not issued earlier, must doubtless be assumed to be evidence that it could not have been issued earlier; and therefore no more time shall be lost in vain regrets. The affairs of the 326 boroughs (exclusive of the Metropolis) that were in existence at the end of the period to which the Blue-Book refers monopolize 250 foolscap pages, practically all of which are filled with figures; and these figures show how great are the duties and the responsibilities that devolve upon those who are public spirited enough to enter the council chamber. The total amount of loans outstanding in 1906 by these borough councils is shown to have been over £240,000,000; and no doubt the sum has since that time grown appreciably.

Loans, Profits, and Losses.

Many objects are represented here; but a few of them may be indicated. Tramways and light railways are responsible for £20,885,784; electric lighting (including public lighting), for £20,043,548; gas-works, for £19,639,606; public roads and streets, for £27,182,791; sewerage and sewage disposal works, for £19,966,605; water-works, for £59,027,300. Education is now answerable for outstanding loans to no less an amount than £18,240,723. As to the gas and electric lighting figures, it may be mentioned that, compared with the immediately preceding returns, the gas-works loans show a decrease of about £120,000, while those for electricity have increased by some £1,250,000. The total rateable value of the boroughs, it will be noticed, is over £72,000,000. As was the case for the previous year, the Blue-Book now before us contains a table showing the transfers that have been made in aid of rates out of profits from, and the transfers from rates to make up deficiencies in revenue on account of, what are generally termed "reproductive" undertakings; and this affords some food for reflection. The particulars that have been gathered from returns made to the Local Government Board show that for the year 1905-6 there was a total profit on such undertakings transferred in aid of rates of £952,796, and a loss made up from the rates of £257,709. Gas-works are responsible for by far the largest profit as well as for the smallest amount of loss. With regard to water-works, the total losses come to considerably more than the aggregate profits. Electric lighting, as compared with the previous year, has somewhat improved its position; though the losses made even now amount to more than one-third as much as the aggregate profits. The total electric light profits shown are no more than £83,084; while those of the gas-works are £521,434. This is an aspect of the statistics to which opportunity may be taken to refer again in a subsequent issue.

Pestering the Manufacturer.

Christmas has passed, but not without further evidence of the repeated pestering of certain of our manufacturers for consideration on the part of (we hope few in number) members of gas-works staffs. These men are either ignorant of the provisions of the Prevention of Corruption Act, or they are their own greatest enemies, and are devoid of shame. There are cases, we know, where those who have solicited have referred to the Act in contemptuous terms. But they are just the sort of individuals who would be the first to sing very small if, designedly or by some slip, the solicitation were exposed to those who are on the lookout for violations of the Act. The present activity of the Treasury authorities, to which reference was made in our columns on the 22nd ult., shows plainly that the Act is intended to be an operative piece of machinery, and not a mere bogle set up simply to frighten. Over some comparatively small matters (a list of convictions published last week shows), there have already been some heavy fines; an alleged attempt to bribe a solicitor's clerk comes on at the Central Criminal Court this month; and there are several other cases now under the consideration of the authorities with the view to action being taken.

The Messina Disaster: An Appeal to the English Gas Industry.—The attention of our readers is called to a letter on the above subject which appears in our "Correspondence" columns. The dreadful disaster which has come upon Messina, and consequently upon those engaged in its gas supply, is unprecedented in the history of the gas industry; and the circumstances call for exceptional action on the part of those engaged in it. An appeal on behalf of the sufferers has been made by the Italian Gas Society, and promptly responded to by the gas fraternity in Italy; and we trust their example may be widely followed by their English colleagues.

Decomposition of Carbon Dioxide by Silent Electric Discharge.—In a communication recently submitted to the Chemical Society by Mr. Alfred Holt, jun., the author stated that carbon dioxide which had been carefully dried by phosphoric oxide was found to be decomposed to an amount which increased as the pressure of the gas diminished. About 48 per cent. decomposition was obtained under 30 mm. pressure, and about 3 per cent. decomposition under 700 mm. pressure. The amount of decomposition was found to vary with the degree of dryness of the gas, the intensity of the discharge, and the form of ozonizer employed; but in all cases diminished pressure gave greater decomposition. Moist carbon dioxide was found to decompose to a larger extent as the pressure of the gas increased; ranging from 3 per cent. decomposition under 50 mm. to about 14 per cent. under 700 mm. pressure. The weaker the discharge the less gas was decomposed at all pressures. Comparison of these results with those obtained when moist and dry carbon dioxide is decomposed by ultra-violet light or induction sparks, leads to the conclusion that the silent discharge at low pressures acts chemically, mainly like ultra-violet light; while as the pressure of the gas increases, it behaves more and more as though it consisted of actual sparks.

OBITUARY.

LADY LIVESEY.

We sincerely regret to record the death last Friday night, at her residence, "Shagbrook," Reigate, of Lady Livesey. The great blow sustained by the deceased lady only three months ago, severing as it did nearly half-a-century of happy wedded life, cannot but have affected her health; but her last illness was only of short duration. Lady Livesey was a daughter of the late Mr. George Howard, and by her marriage in 1859 she found scope for the exercise of qualities which endeared her to many. To her husband she was a veritable "help meet"—the sharer of his joys, the sympathizer with him in times of storm and stress, and his willing associate in the carrying out of all those beneficent schemes which were marked features in his long and useful career. It would probably be difficult to find a couple more of one mind in work of this kind than the lady whose death we now record and her partner, whose removal the entire gas industry deplored only three months ago. It was little thought then that the survivor would so soon be called to follow him. Truly, they were "lovely and pleasant in their lives, and in their death they were not divided." It will be remembered that, in accordance with the terms of Sir George Livesey's will, recently given in the "Journal," a number of bequests were made contingent upon Lady Livesey's life. These provisions will, of course, now come into operation.

The "Journal für Gasbeleuchtung" reports the death of Herr A. Schmiz, the Manager of the Municipal gas and water works at Eupen, near Aix-la-Chapelle.

The death occurred on the 28th ult. of Alderman Thomas Crawford, who had been a Director of the Walker and Wallsend Union Gas Company from its formation. Deceased was in his 83rd year.

Mr. John Hartley, one of the original Directors of the Carnforth Gas and Water Works Company, died at Millhead House, Carnforth, on the 1st, aged 67 years. Deceased was prominently associated with religious and philanthropic work.

Mr. W. Bartholomew, Gas Manager at Ochiltree, Ayrshire, who, it was stated in the "Notes from Scotland" last week, was found on the evening of Wednesday, the 30th ult., within the purifier house in a state of unconsciousness, has since died in the Ayr Hospital from the effects of gas poisoning.

It was with regret we received intimation of the death, on the last Wednesday of 1908, after a long illness, of Herr Auguste Klönne, the chief of the Dortmund gas-plant manufacturing firm. In the gas profession, of course, Herr Klönne was universally known, either personally or by reputation—primarily in connection with the early forms of regenerative furnaces which bear his name.

We regret to record the sudden death, last Tuesday, at the advanced age of 85, of Mr. John Kellett, the Chairman of the Northampton Gas Company. Deceased had been a Director since 1892; and three years ago he succeeded Dr. Moxon in the chair. He was held in high esteem; and his funeral, which took place at the General Cemetery on Friday afternoon, was attended by a large number of friends.

On the morning of the 24th ult., the death occurred of Colonel J. B. Cochrane, V.D., as the result of a long illness. Deceased was one of the best-known ironmasters in the Midlands; being the principal of the Woodside Iron-Works, near Dudley. He was a pioneer in the application of Mond gas for blast-furnace purposes; and years ago he put down at Woodside expensive plant for its production. He was a great believer in the value and prospects of this motive power for general manufacturing purposes, and was a Director of the Mond Company. Deceased was about seventy years of age.

Mr. Silas Scott, who died last week at Shipley, at the ripe age of 82, was at one time an energetic member of the Bradford Town Council. He was mainly instrumental in securing the purchase of the Bradford Gas Company's undertaking, and for some years occupied the position of Chairman of the Gas Committee. In the course of an appreciative notice, the "Yorkshire Observer" says that the term of Mr. Scott's membership of the Council covered a period of remarkable development in the history of Bradford; and his name is still linked with the acquisition of the gas-works, which had been established by a private Company in 1822, with a modest capital of £15,000. The question was raised in 1869, when Mr. Scott moved the appointment of a Committee to inquire into the subject; and the Smoke Prevention Committee were chosen to act. Under the leadership of Mr. Scott, this Committee collected much information, obtained the opinion of eminent Counsel, and approached the Directors of the Company, but advanced to nothing more definite than a pious declaration that it was highly desirable that the supply of gas in large towns should be in the hands of the ruling authorities. The Committee were afterwards re-appointed with power to arrange a purchase of the plant upon the best terms they could. It was not until 1871 that the Bradford Gas and Improvement Act was obtained, in which powers were acquired for taking over the gas-works; the sum eventually agreed upon being £210,000. The result of the transaction was, of course, a great pecuniary advantage to the ratepayers. The actual transfer of the Company's plant to the Corporation took place on July 11, 1871, and was celebrated by a banquet, at which full acknowledgment was made of the conspicuous and public-spirited service which Mr. Scott had rendered to the community.

THE GAS REFEREES' NOTIFICATION FOR 1909.

The Notification of the Metropolitan Gas Referees for the current year, which was issued on Saturday, does not contain many changes from its immediate predecessor; and the principal ones are, as before, indicated by the use of italics.

In the section dealing with the mode of testing for sulphur compounds other than sulphuretted hydrogen, a foot-note is added with regard to the washings. These, it may be remembered, are to be divided into two equal parts—one-half of the liquid being set aside, in case it should be desirable to repeat the determination of the amount of sulphur contained in it, and the other half treated with hydrochloric acid as directed. The new foot-note has reference to the second half; and it is as follows:—

> If preferred, a smaller proportion—say $\frac{1}{n}$ part—of the liquid may be taken for the determination, in which case the number of grains of barium sulphate obtained must be multiplied by $\frac{11\,n}{8}$ instead of being multiplied by 11 and divided by 4.

In the section on the mode of testing the calorific power of the gas, the third paragraph now opens as follows:—

> In order to test the gas for calorific power, the gas shall first pass through a meter and a balance governor of the same construction as those on the photometer table. It shall then be led to the gas inlet in the base of the calorimeter. The gas shall be turned on and lighted, and the *form of the two flames observed. If either is out of shape, this must be rectified either by clearing the burner or by substituting another burner. The tap of the calorimeter shall then* be so adjusted as to allow the meter hand to make one turn in from 60 to 75 seconds.

In the section on meters, the direction, towards the close of the first paragraph, to the effect that the meters should be provided with Fahrenheit thermometers is followed by the sentence:

> At least once in every year, each meter thermometer is to be compared with a calorimeter thermometer; and if the discrepancy is more than half-a-degree Fahrenheit the meter thermometer is to be replaced by a new one.

In Appendix D, the description of the flat-flame burner has been altered, its constituent parts being stated to be a brass tube with a tapered and screwed end, in which are secured the following parts, through which the gas passes in order:

> A steatite disc with a round hole in the middle between 0·055 and 0·060 inch in diameter; a diaphragmconsisting of three thicknesses of gauze; a second similar diaphragm separated by a space from the first; a steatite batswing burner whose slit is semicircular in form, having an external diameter at the base of between 0·32 and 0·33 inch, and a width less than 0·029 inch and greater than 0·027 inch.

In the remarks on the adapter, it is now specified as "*containing a ground conical socket;*" and the *adapter* (not the burner, as before) is to be so turned that the plane of the flame makes an angle of about 45° with the line joining it and the slit in front of the photoped.

It has been impossible to indicate the positions of the alterations by reference to pages, inasmuch as the matter of the Notification and of the appendices has all been compressed, so as to occupy only 37 instead of 51 pages. These regulations are to remain in force from the 1st inst. until they are superseded by a subsequent Notification.

The Home Secretary has appointed a Departmental Committee to inquire into the sufficiency of the existing regulations relating to the storage, use, and conveyance of petroleum spirit; and to report what further precautions, if any, are in their opinion desirable, as tending to diminish the dangers attendant thereon. The Committee is constituted as follows: Sir Henry Cunynghame, K.C.B., Chairman; Sir Boverton Redwood, D.Sc., F.R.S.; Major Cooper-Key, His Majesty's Chief Inspector of Explosives; and Mr. James Ollis, the Chief Officer of the Public Control Department of the London County Council. The Secretary to the Committee is Major T. H. Crozier, one of His Majesty's Inspectors of Explosives.

At a lecture recently given in Berlin, on the use of tar on roads, it was announced that though layers of tar spread over the roads for the prevention of dust had proved very effective in many large cities, this method had not been altogether a success in Berlin, and that the municipal authorities were always on the look-out for new means of combating the dust nuisance. Trials with mineral oils as a means of reducing dust on asphalted roads to a minimum had, it was said, been pursued with so much success that considerable sums had been included in the Budget for the present year for the application of this special method of dust prevention. Trials were made on a road leading to the much-frequented Tegel Lake, near Berlin; duralit, tar, and westrumite having been used in succession. Practical steps in the matter of the prevention of dust are now being taken all over the province of Brandenburg.

THE LAST COMMUNICATIONS OF THE LATE MR. WILLIAM YOUNG.

2.
PURIFICATION OF THE RESULTING GASES.

In the first of the previous articles reference was made by me to early experiments upon the purification of coal gas by means of caustic ammonia, as having resulted as a side-issue from experiments with apparatus for the economical manufacture of sulphate of ammonia from the large quantity of ammonia water produced from vertical retorts in the distillation of shale. Some reference was also made to a further development of a process for the purification of coal gas as described in the specification of patent No. 16,052 of 1885.

I need hardly premise by saying I am aware of the sceptical view that will be entertained regarding any ammonia purification process by those engaged in the gas industry, and I admit that after the many trials that have been made with such processes—more particularly by Mr. James Stelfox at Belfast with the Claus process—there is some cause for taking such a view.

I have to remark, however, that after having carefully studied all that has been done in the matter, and having visited Belfast and seen the Claus process in operation there, and after having carefully weighed and reconsidered the whole subject, I feel convinced of the possibility of economically, and with a perfect avoidance of all nuisance, purifying gas with ammonia. I may be wrong; but I believe the failures in the past to have been due to the physico-chemical laws on which the process is based not having been thoroughly investigated and properly utilized on sound mechanical principles.

As all interested in the subject are aware, the process of using ammonia for the purification of gas is based upon the observed fact (first applied to the purification of gas by Hills) that, under ordinary atmospheric conditions as to temperature and pressure, the ammonia, sulphuretted hydrogen, and carbonic acid present in gas liquor are in chemical combination, and that while so combined the individual tensions of the ammonia, sulphuretted hydrogen, and carbonic acid are much lower than they are when in the free or gaseous state. As a consequence, water can hold a much larger quantity of the sulphuretted hydrogen and carbonic acid in solution. On our heating up such a solution to a temperature a little over 160° Fahr., the chemical affinity is overcome; and the three gases (ammonia, sulphuretted hydrogen, and carbonic acid) are then held in solution not as carbonate and hydrosulphate, but in accordance with Henry's law—that of their relative solubilities in water under equal circumstances as free gases. As the solubility of ammonia in water is under like circumstances immensely great compared with that of the two acid gases, the ammonia is in consequence mainly held in solution, while the acid gases are liberated in proportion to their less solubility in the water. Of course, the acid gases leave the surface of the solution saturated with water vapour at the temperature at which they are liberated, and they also take up in diffusion and carry away a small quantity of ammonia gas dependent upon the amount in solution—in other words, there is equilibrium between the tendency of the water to hold the ammonia in solution, and that of the water vapour and acid gases to take it up in diffusion, at the temperature and under the pressure at which they are liberated. To state it in another way: Hills's process for obtaining a supply of ammonia in a caustic state, for the purification of gas, consisted in applying the forces of chemical affinity and physical solution on the counter-current principle—that is, he had a series of superposed vessels or stills (three are shown in the specification of his patent), into the uppermost of which was fed the crude ammoniacal liquor to be rendered caustic. From this, the liquor flowed downward through the intervening vessels to the lowermost, where the liquors were heated by means of a steam-coil to a temperature of about 180° Fahr., at which temperature the water is still possessed of considerable solvent power for ammonia gas, but has a comparatively feeble solvent power for the acid gases. The hot acid gases, thus liberated and saturated with water vapour, and carrying with them a small quantity of ammonia gas, in passing upward through the down-flowing ammoniacal liquor were fractionally cooled and washed; the ammonia was mainly reabsorbed at the reduced temperature, and returned to the lower vessel; while the cooled acid gases escaped from the upper vessel. Of course, the down-flowing liquors were at the same time heated and fractionally decomposed and denuded of their acid gases. The resulting caustic liquors were afterwards cooled and used in reabsorbing an equivalent of acid gas from the coal gas in any convenient scrubber or washer arrangement.

In a specification of a subsequent patent—No. 510 of 1870—Hills describes an improvement on his former patent. This consisted in distilling the purified gas liquor obtained by his previous arrangement, so as to liberate the ammonia it contained in the form of vapour. This he passed direct into the gas, or he condensed the concentrated ammonia vapours in water, and employed the concentrated solution so obtained to purify the gas by its use in any convenient washer or scrubber.

All the various processes of ammonia purification that have since that date been tried or proposed—including those of Livesey, Hammond, Claus, the writer, and others—have been based upon these laws of chemical affinity and physical solution in water, and the original processes of Hills, and have consisted of modified methods of applying these principles.

The success of any process depends, however, largely upon the manner in which the principles—chemical, physical, and mechanical—are applied to attain a desired object.

It will be evident that none of the processes that have received a practical trial have really possessed the elements essential to the economical and complete purification of gas; otherwise, they would have been in use. The purpose of this article is to explain what appears to me the manner or mode in which they may be applied to accomplish the desired object.

Ammonia purification differs from all other purification mainly in the purifying agent being produced from the coal along with the gas. Had the ammonia been produced in larger proportions —say, three or four times as much as it is—the gas would have been self-purifying.

The object of the ammonia-purifying process is to utilize the ammonia produced, and, by re-use, to supply that deficiency; and the problem to be solved is how to do this in the most economical manner.

In the ordinary process of carbonizing coal, there is produced, along with the gas, a quantity of ammonia equivalent to the production of from 20 lbs. to 30 lbs. of sulphate, along with about an equal number of gallons of water, dependent upon the class of coal used, and the method (and temperature) in which the coal is carbonized. Under any circumstances that constant production of ammoniacal liquor has to be disposed of, and in the larger sized gas-works, such as those in which an ammonia purification process could be most economically introduced, this liquor can be most profitably utilized by the manufacture of the ammonia into salts of ammonia—mainly sulphate. This manufacture involves the use of fractionating stills and absorbing vessels for the ammonia and evolved gases. It is therefore evident that as similar stills and absorbing vessels are necessary in any ammonia purification process, if the two processes can be conjoined in the requisite plant, manual labour and attendance are saved, as also fuel—more particularly the two former items—as by simply modifying the units of the apparatus, both the processes, manufacturing the ammonia salts and the purification of the gas, could be carried on more economically in all respects.

Hammond's and Holgate's processes embody that idea, and so also does that of Claus to a less extent. The conditions obtaining in the two former processes are, however, such as to render only partial purification possible; and from what I saw of the latter at Belfast, neither the chemico-physical principles, nor yet the mechanical arrangements for applying these principles, were such as could result in economical success. This was mainly due to the elaboration of the process through the large number of parts of the apparatus, and the number of times that the ammoniacal solution had to be repeatedly pumped from vessel to vessel in a more or less caustic state—involving great loss by volatilization of the ammonia, besides great manual labour, attention, and expenditure of fuel.

As every one engaged in the manufacture of sulphate or other products from ammoniacal liquors is aware, it is a great advantage to have these liquors as strong as possible—that is, containing the largest possible quantity of ammonia per gallon of water, as with such strong liquors a given size of plant can produce a much greater weight of sulphate or other products with the same labour and fuel. Similar remarks apply to the application of caustic ammonia to the purification of gas. It is therefore evident that, in devising a process in which the two operations of purifying the gas and working up the liquors into products are combined, all the conditions enabling a strong solution of ammonia in water to be used in the double process, should as far as possible be realized.

It may be interesting and instructive at this point to give some consideration as to how these conditions can be modified by the manner in which the physico-chemical laws are brought into action. The following table—after Dalton—gives the specific gravity and percentage of ammonia that can be held in solution at different temperatures:—

Specific Gravity.	Percentage of Ammonia.	Boiling Point.
·85	35·3	− 4° C.
·86	32·6	+ 3 to − 5°
·87	29·9	10°
·88	27·3	17°
·89	24·7	23°
·90	22·2	30°
·91	19·8	37°
·92	17·4	44°
·93	15·1	50°
·94	12·8	57°
·95	10·5	63°
·96	8·3	70°
·97	6·2	79°
·98	4·1	87°
·99	2·0	92°

As will be seen from the above table, if pure ammonia gas be slowly bubbled through water that is kept at 180° Fahr., and under

ordinary atmospheric pressure, the water will take up in solution 5 per cent. of its weight of ammonia. If carbonic acid gas be thereafter passed through the solution of ammonia in water so obtained, and kept at the same temperature (180° Fahr.), the carbonic acid will not at that temperature enter into chemical combination with the ammonia in the water, but the water will take up some of the carbonic acid in solution, while the excess of carbonic acid gas will take up in diffusion from the water, and will carry away with it, a small quantity of ammonia gas. If now the flow of carbonic acid can be stopped, and ammonia gas be again bubbled through the solution, the water will again absorb ammonia equivalent to what has been carried away by the carbonic acid, and the excess of ammonia gas would carry away the carbonic acid previously taken up in solution.

Experiment shows that the strongest possible solution which can be rendered caustic under ordinary atmospheric pressure by the Hills process at a temperature of 180° Fahr. could not contain more than 5 per cent. of ammonia; and if, in order to hasten the process, the temperature was raised, the quantity of ammonia that could be held in solution would be (as shown by Dalton's table) proportionately reduced. It further shows that, when rendering ammoniacal liquors caustic by the Hills process, it is necessary, in order to retain the causticized ammonia solution at its maximum strength, that during the last stage the solution should as far as possible be subjected to a stream of ammonia gas, or steam saturated with ammonia; and that the more ammonia gas there is passed through the solution after this has been raised to a temperature above the dissociating temperature of the ammonia and the acid gases (sulphuretted hydrogen and carbonic acid), the more rapidly will these gases be liberated from solution.

The following two diagrams, copied from the specification of patent No. 1587 of 1881, illustrate the nature of the plant with which, at the Pentland Oil-Works, the experiments were made that lead up to the devising of the purification process now under consideration.

The fractionating still arrangement with which the experiment was made was 6 feet in diameter and about 25 feet high, and consisted of twenty compartments or vessels placed over each other. The bottom of each compartment had about 150 tubular openings, or short vertical pipes cast in them, and these were covered by cast-iron caps, serrated round the lower edges. The ascending stream of ammonia and acid gases was thus broken up into numerous streams, and brought into intimate contact with the descending

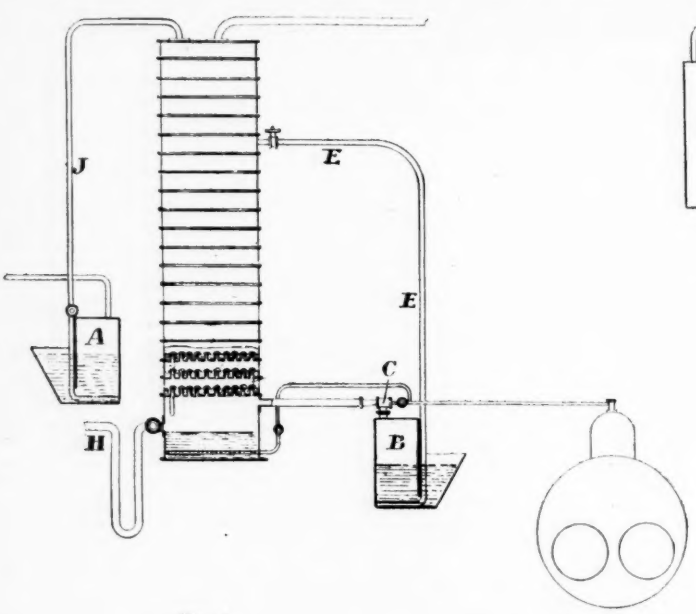


Fig. 1.

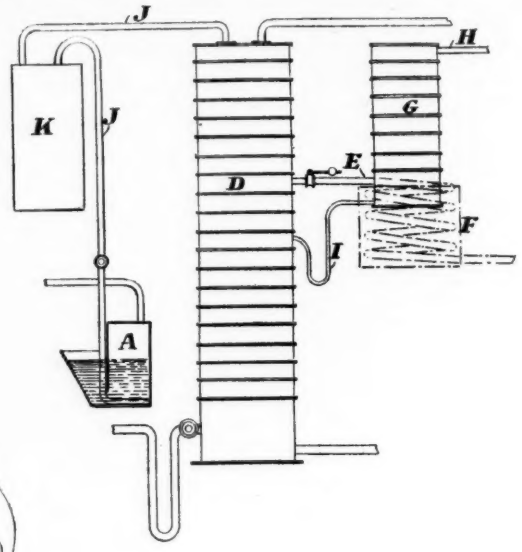


Fig. 2.

Diagrams Reproduced from Young's Patent No. 1587 of 1881.

current of the liquors. The ammoniacal liquor was fed into the top of the still by a donkey pump, the exhaust steam from which, supplemented by live steam, was passed direct into the bottom compartment of the still. The feed could thus be measured and regulated to the quantity desired. This still was capable of dealing with about 40,000 gallons of ammonia liquor per 24 hours, leaving only a mere trace of ammonia in the effluent.

The object of the original experiment (as diagrammatically illustrated in fig. 1) was to economize the steam necessary to distil the ammonia out of the liquor; and the idea was continuously to circulate the steam alternately up through the ammoniacal liqour, and down through the still and through the acid in the saturator. Thus the steam would alternately denude the ammoniacal liquor of ammonia and carry it to the acid to form sulphate. To enable this to be successfully done, it was found necessary to get quit of the acid gases in chemical combination with the ammonia in the liquor; otherwise these accumulated in the circulating steam, and greatly interfered with the operation. This object was accomplished (as shown) by utilizing the five upper compartments of the still to effect the separation of the major part of these gases from the ammonia as in Hills's process, and regulating the steam sent in so that the lowermost of the five compartments should attain a temperature not exceeding 200° Fahr. The acid gases so liberated were passed through the sulphuric acid in the saturator A, to absorb any ammonia accompanying them; and thence they passed to the oxide purifier to be absorbed.

The ammonia liquors, thus freed from acid gases in the five upper compartments of the still, had the ammonia, mainly held in solution in the caustic state, practically completely removed from them in the remaining compartments of the still by the ascending current of steam made to circulate, by the powerful steam jet C, alternately through the still, so as to take up ammonia from the descending liquor, and to give it up to the sulphuric acid in the saturator B.

This method of distilling the ammoniacal liquor for the production of sulphate of ammonia suggested the possibility of utilizing the same class of still to obtain a supply of ammonia in the caustic state, for the purification of gas, on the principle of combining Hills's two processes in one—that is, eliminating the acid gases and rendering the liquor caustic in the upper compartments of the still, distilling out the ammonia from the causticized liquors in the lower part of the still, and drawing away the ammonia vapours from the still at a point between those at which the two operations were effected, and employing these ammonia vapours in the purification of the gas.

Fig. 2 illustrates an arrangment of apparatus such as could carry out this combined process.

It will be observed that the same principle is retained of utilizing the upper compartments of the still to render the ammoniacal liquors caustic, and the lower compartments to distil out of the liquors the causticized ammonia. The only essential difference in this regard is that, instead of the causticized ammoniacal vapours being drawn from the sixth compartment of the still, as when making sulphate by the process just described, it was necessary, in order to get the ammonia in a sufficiently caustic state for the purpose of purification, to devote a greater number of the upper compartments of the still to the elimination of the acid gases. But, of course, as can be easily understood, the relative number of the compartments of the still necessary to use for each of the two operations depended upon a number of factors—such as the strength of the liquor, the rate of passing through the still, &c.

To ascertain the effect of these various factors, a number of the compartments of the still were tapped, and provided with test-cocks, so that samples of the ammoniacal liquors and of the evolved vapours could be withdrawn from these compartments, and their quantities and the condition of the ammonia which they contained could be ascertained at the different positions in the still. By these means, it was ascertained that, with the liquors employed at the Pentland works, the best results were obtained by limiting the quantity of ammoniacal liquor passed through the still to about half that passed when making sulphate, and regulating the supply of steam entering the bottom of the still, so that the caustic ammonia vapours should be drawn away from the eighth compartment from the top. When so used, the still was capable of producing caustic ammonia vapours sufficient to purify about a million cubic feet of ordinary coal gas per day.

With regard to the application of the ammonia to the purification of the gas and other matters under consideration, possibly the best way will be to quote from the patent specification, which says:

The caustic ammonia and steam produced as before described, on leaving the stilling arrangement D* by the pipe E may be conveyed direct to the condenser and commingled with the impure coal gas, and thus allowed to absorb the gaseous impurities. But I prefer first to cool the mixed steam and caustic ammonia by passing through a cooling-coil of pipes indicated at F, immersed in water where they are condensed, and the caustic liquor, with any uncondensed ammonia gas, is passed direct into a scrubbing arrangement similar in construction to the fractional distilling arrangements previously described—only, of course, larger, in proportion to the volume of gas it has to pass—preferably entering at about the middle vessel or compartment of each scrubbing arrangement. Or the ammonia and steam may be fractionally cooled and separated to a large extent by means of the supplementary stilling arrangement G; the ammoniacal gas passing away by the pipe H and introduced into the coal gas as it enters the scrubber or washer. The syphon bend I is for conveying the condensed water from the fractionator G back into the fractionating still D.

The passing of the ammonia into the gas in either of these modes leads to the absorption of the impurities from the gas by the caustic ammonia, and the production of a very strong solution of ammoniacal liquor. By re-using the concentrated solution of ammonia in the fractional stilling arrangement, a small amount of heat is required to liberate the impurities, rendering the ammonia caustic, and again re-volatilizing the caustic ammonia, to be again passed into the coal gas and used to remove impurities.

The ammoniacal liquor may be thus made so strong as to make it impossible to render it caustic without the simultaneous passage of a considerable volume of ammonia.

When desirable, this process can be very conveniently combined with the production of salts of ammonia, such as the carbonate or bicarbonate, by passing the mixed gas and ammonia from the top of the stilling arrangement D by the pipe J into any convenient crystallizing chamber placed between the stilling arrangement D and the saturator A, as indicated at K, and then allowing the carbonized salts of ammonia to settle out.

As the above patent preceded that of Claus, it will be observed from the quotation here given that it anticipated Claus's improvement over that of Hills, inasmuch as it described a method of drying the ammoniacal gas before mixing with the coal gas to be purified—substantially identical in principle with that described in Claus's specification.

Indeed, the only essential difference between the above-described process and that of Claus was that, instead of employing six to ten separate pieces of apparatus—involving that the same ammoniacal liquor should be pumped as many separate times (some of these while the liquors were in a heated and a partially caustic condition)—the same process was accomplished in two pieces of apparatus, with one single pumping of the ammoniacal liquor, and that while cold.

As I have already explained, however, in my case the working of the process was a side-issue, and did not form part of the industry in which I was engaged at the time; and for that reason it was only experimented with, but was never brought into practical use. Although, however, there was nothing pressing me to a further consideration of the subject, the experimental work in which I had been engaged had so interested me that, willy-nilly, I could not keep my mind from further considering how some of the problems that had presented themselves could be solved.

The prominent objection to all these processes was the very large quantity of ammoniacal liquor that it was necessary to handle in order to obtain sufficient caustic ammonia to purify a given volume of gas, and the quantity of fuel required; and my mind was naturally directed to considering how the objections to the process could be overcome.

As has been already explained, the reason why it was necessary to use such a large quantity of ammoniacal liquor lay in the necessity of heating up these liquors above a certain temperature, so as to overcome the chemical affinity of the acid gases, and subsequently to liberate the acid gases from solution in the liquors at a rate that would render the process practically workable, without also liberating at the same time an excessive quantity of ammonia. In other words, the success of the process depended upon the relative solubility of the ammonia and the acid gases in water at temperatures between that of chemical dissociation of the ammonia from the acid gases, and the boiling point of the water. The higher the temperature employed, the faster could the process be conducted, but proportionately the less caustic ammonia could be left in solution.

Up to that date, all these processes had been conducted under atmospheric pressure. In pondering over the problem, it occurred to me—seeing that the solubility of all gases in water was not only dependent upon temperature but also upon the pressure under which they were kept in contact with the water, and that the boiling point of water was also raised by increased pressure—that if, instead of conducting the process under atmospheric pressure, the pressure were increased to two or more atmospheres, the ammonia and the acid gases would, under like temperature conditions, be held in solution in proportionately larger quantities.

Of course, these results would depend upon whether or not the temperature at which the ammonia and the acid gases chemically dissociated from one another was not proportionately raised.

On subjecting this mental deduction to practical trial, it was found that, under such conditions as to pressure, much stronger ammoniacal liquor could be employed in the purifying process; and in 1885 I obtained a patent (No. 16,052) for apparatus and a process embodying these principles.

It is not necessary for present purposes, and it would burden this article to quite an unnecessary degree to go into a detailed description of that apparatus and process. Those sufficiently

* The reference letters have been altered from the original so as to conform to this description.—Ed. J.G.L.

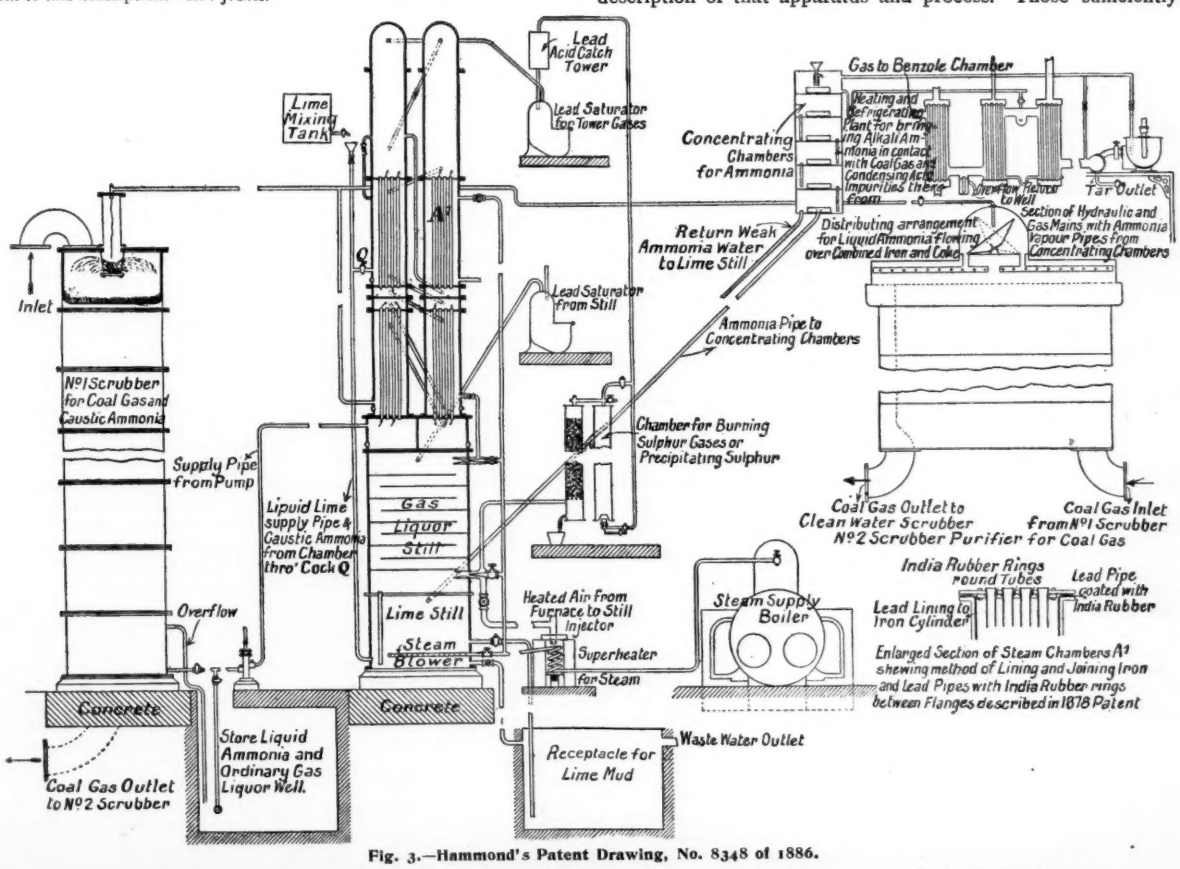

Lead Acid Catch Tower
Lime Mixing Tank
Lead Saturator for Tower Gases
Gas to Benzole Chamber
Concentrating Chambers for Ammonia
Heating and Refrigerating Plant for bringing Alkali Ammonia in contact with Coal Gas and Condensing Acid Impurities therefrom
Overflow Pipe to Well
Tar Outlet
Section of Hydraulic and Gas Mains with Ammonia Vapour Pipes from Concentrating Chambers
Distributing arrangement for Liquid Ammonia flowing over Combined Iron and Coke
Return Weak Ammonia Water to Lime Still
Lead Saturator from Still
Ammonia Pipe to Concentrating Chambers
Inlet
No1 Scrubber for Coal Gas and Caustic Ammonia
Supply Pipe from Pump
Chamber for Burning Sulphur Gases or Precipitating Sulphur
Liquid Lime supply Pipe & Caustic Ammonia from Chamber thro' Cock Q
Gas Liquor Still
Coal Gas Outlet to Clean Water Scrubber No2 Scrubber
Purifier for Coal Gas
Coal Gas Inlet from No1 Scrubber
India Rubber Rings round Tubes
Lead Pipe coated with India Rubber
Lead Lining to Iron Cylinder
Overflow
Lime Still
Steam Blower
Heated Air from Furnace to Still Injector
Steam Supply Boiler
Superheater for Steam
Enlarged Section of Steam Chambers A1 shewing method of Lining and Joining Iron and Lead Pipes with India Rubber rings between Flanges described in 1878 Patent
Concrete
Concrete
Store Liquid Ammonia and Ordinary Gas Liquor Well.
Waste Water Outlet
Receptacle for Lime Mud
Coal Gas Outlet to No2 Scrubber

Fig. 3.—Hammond's Patent Drawing, No. 8348 of 1886.

Apparatus for the Complete Purification of Coal Gas by Concentrated Liquid Ammonia and the Recovery of the Sulphur and Ammonia.

interested can refer to the specification of the patent. Meantime it may be sufficient to explain that it substantially consisted of an improved form of apparatus for carrying out Hills's original processes under pressures considerably over that of the atmospheric, instead of under ordinary atmospheric pressure; the apparatus being made sufficiently strong to stand the application of such pressures.

Since that date I have continued to take a deep interest in the subject, and since forming the acquaintance of Mr. John Hammond, and discussing with him the problem of gasifying coals in vertical producers, and learning of his practical experiences resulting from the use of coal along with coke in carburetted water-gas plant at Eastbourne, and also of his practical experiences extending well-nigh over thirty years in the partial purification of gas by means of caustic ammonia obtained in conjunction with the manufacture of sulphate of ammonia, I was induced to join with him in devising a solution of the problem; and the diagrammatic drawing fig. 3 illustrates the general arrangement for carrying out the principles jointly devised by us for the purification of coal gas (mainly from carbonic acid) by means of ammonia obtained in conjunction with the manufacture of sulphate of ammonia.

It will be observed that the essential novelty in the Young and Hammond process consists in carrying out the previously described processes by new arrangements of apparatus and methods of operating them, by which the principle of regeneration is as fully as possible applied, and the heat and mechanical energy used in the process as far as possible utilized in doing useful work.

The still employed for the treatment of the ammonia liquor is the same in principle as that described above. It consists of a series of superposed vessels, provided with tubular openings, all covered by caps serrated round their lower edges. The steam is introduced into the lower of these vessels, and the descending ammoniacal liquors are similarly acted upon by the ascending steam. The essential difference is that, instead of the portion of the steam holding the caustic ammonia being drawn away from the side of the still, and the heat which it contains being dissipated to the air, that portion of the steam, with its ammonia, is made to pass up through a large number of vertical pipes, and is thus made to give up a large portion of the heat which it contains to the descending ammoniacal liquors—thus assisting in the liberation of the acid gases; and the caustic ammonia gas is thus partially freed from the accompanying steam.

As will be seen, these vertical tubes are screwed or otherwise fixed into the bottom plate of a collecting chamber placed over the still, and are passed down through the plates forming the compartments of the still through easy-fitting holes bored in the plates between the serrated caps, so that the tubes are free to expand and contract with changes of temperature.

The tendency of the ammoniacal liquor to leak down through and around these tubes is counteracted by the pressure of the ascending steam. Besides, a small leakage, even if it did take place, would not interfere with, but would rather help in the action of, the still.

Utilization of Brown Coal.—This was the subject of a paper recently read at a meeting of the Society of Chemical Industry in Melbourne by Mr. Wykeham Bayly. The author stated that Victoria more than any other State was favoured with valuable brown coal; the deposits being practically beyond computation. In many respects the deposits were equal in value to those in Germany, which produces nearly 50 million tons of brown coal annually. He had obtained ammonium sulphates and other valuable products from the coal, and found it exceptionally well adapted for making producer gas. By reducing the watery contents 10 to 18 per cent., and using hydraulic pressure, he had made briquettes which were superior in calorific value to those made in Germany. It was, however, for producer gas purposes that the brown coal in Victoria could be best utilized.

Peat Gas for Power Purposes in Germany.—According to an article in the Engineering Supplement to "The Times," a large installation of plant for the use of peat for the production of gas on the Caro and Frank system has recently been set to work. This undertaking, which is the second of its kind, aims at bringing a portion of the extensive peat bogs which spread out over the North-West of Germany into systematic cultivation, with the simultaneous distribution of electrical energy over a wide area for agricultural purposes, as also for the provision of light and power in a number of towns situated within a radius of 50 kilometres round the works. The central generating station is built on part of the area of the so-called Königsmoor, 25,000 morgen (15,750 acres) in extent; and over this vast uncultivated district it is intended to provide a network of canals attaining to a total length of 40 kilometres. The dredging-out of the turf will be effected by huge peat-bog ploughs, which will be driven forwards in the line of the future canal by electrical energy. The turf that is thereby excavated will be electrically conveyed to two sets of peat-presses, erected at the generating-station; and it will there be worked up and converted into fuel, after having been sufficiently freed from water. The blocks thus manufactured will serve as the only fuel used for the electric generating plant. It is estimated that by means of large gas-engines work to the extent of 600-H.P. hours will be obtained from each ton; while the value of the ammonia recovered is estimated to yield a good interest on the investment.

THE LIVESEY MEMORIAL FUND.

We have received from Mr. Walter T. Dunn, the following list of further contributions to the above-named fund:—

1909.		£	s.	d.
Jan. 3	Amounts already acknowledged . . .	604	8	0
„ 4	Henry Sykes, Limited, London . . .	2	2	0
„ 5	Daniel Amos, Chairman, Canterbury Gas and Water Company	2	2	0
	Walter King, London	21	0	0
	L. W. Nuttall, Gosport	0	10	6
„ 6	Corbet Woodall, Westminster. . . .	52	10	0
	Thomas Berridge, Leamington . . .	10	10	0
„ 7	British Gaslight Company	200	0	0
	Major-General W. T. Corrie (British Gaslight Company), Ealing	1	1	0
	Douglas Gaslight Company	5	5	0
	Duckham, A. M.	12	10	0
	Imperial Continental Gas Association .	250	0	0
	Stanley H. Jones, Stepney	2	2	0
	Thomas Newbigging, Manchester . .	21	0	0
	John Horsley Palmer, Chairman British Gaslight Company, and Imperial Continental Gas Association	5	5	0
	H. Woodall, Bournemouth	12	10	0
	A. F. Yarrow, Blackheath	10	10	0
	J. H. Birchenough, C.M.G. (Directors of the Imperial Continental Gas Association.)	1	1	0
	Sir Charles J. Jessel, Bart. (Directors of the Imperial Continental Gas Association.)	1	1	0
	Hon. Sir E. Chandos Leigh K.C.B., K.C. . . . . (Directors of the Imperial Continental Gas Association.)	1	1	0
	Colonel H. Le Roy-Lewis, D.S.O. . . . . (Directors of the Imperial Continental Gas Association.)	1	1	0
	H. Goodwin Newton . . . (Directors of the Imperial Continental Gas Association.)	1	1	0
	Robert Tindall . . . . . (Directors of the Imperial Continental Gas Association.)	1	1	0
	Leonard R. Wilkinson . . (Directors of the Imperial Continental Gas Association.)	1	1	0
	Frederick Wilkin, Wadhurst	1	1	0
„ 9	Anderson Bros. (George W. Anderson & R. Bruce Anderson), Westminster . .	2	2	0
	Charles Carpenter, Chairman, South Metropolitan Gas Company	52	10	0
	Harold G. Colman, London	5	0	0
	Richmond Gas Company	21	0	0
	R. G. Shadbolt, Grantham	1	1	0
	Alexander Smith, Glasgow	2	2	0
	Weston-super-Mare Gaslight Company .	10	10	0
„ 11	Arthur E. Broadberry, Tottenham . .	5	5	0
	R. H. Sainsbury, Trowbridge		10	0
	Total	£1321	13	6

Mr. A. G. Kitching has resigned the chairmanship of British Coalite Limited, and is succeeded by Sir William Preece, F.R.S., the Deputy-Chairman. Mr. Kitching, however, retains his seat on the Board.

Lightning-rod tips for chimneys should have three or four points, according to Dr. N. Monroe Hopkins. The rods should be ¾ inch in size, 10 feet long, and about 4 feet apart, round a 1½ in. by ¼ in. copper ring placed 5 feet below the chimney top, with copper ground cables.

A line of 48-inch cast-iron pipe to carry water under a maximum head of 600 feet has recently been completed at Scranton (Pa.) by the Scranton Gas and Water Company. The pipe is in 12-feet lengths, somewhat over 2 inches thick, and weighs upwards of 10,000 lbs. per length. The total length is about three miles, and it will carry water from Lake Scranton to the city. For 4025 feet the pipe is laid through a 7 ft. by 9 ft. tunnel, recently completed. The tunnel was driven and the line laid under the direct control of Mr. W. M. Marple, the Chief Engineer of the Company.

The "American Gaslight Journal" reports that one of the largest and most up-to-date sets of water-gas apparatus was put in operation recently by Mr. Robert M. Searle, in the plant of the Rochester (N.Y.) Railway and Light Company. The apparatus in the main comprises a standard double superheater twin generator setting, up to a daily capacity of 3 million cubic feet—a capacity well in advance of any other water-gas apparatus in use. With this installation go many innovations and refinements—meters for measuring the quantities of air and steam applied to the setting, and pyrometers for registering the temperatures in the apparatus. The air required is supplied by an electrically driven Sturtevant blower. The set when in full blast uses about these quantities of materials per diem: Oil, 13,000 gallons; coke, 19,000 lbs.; steam, 84,000 lbs. The installation was designed and constructed by the United Gas Improvement Company, of Philadelphia.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 122.)

BUSINESS on the Stock Exchange last week was generally below a fair average, and on one or two days very quiet indeed. Two prominent factors were the new large issues which drew money away from the Exchange, and the political outlook in the near East, which caused an alternation of hopes and fears. Markets opened on Monday full of cheerful intent; but this was not maintained. Foreign affairs were regarded with apprehension, and weakness generally supervened. Consols fell $\frac{3}{16}$. Uneasiness continued next day; but before the close things took a rather brighter turn. Wednesday was a quiet day. But the tendency was calmer, and a fair amount of buying imparted life and firmness into good investment lines. The feeling on Thursday was scarcely so favourable; but in the gilt-edged division Railway secured issues were in demand. Consols continued to shrink. On Friday, the same firmness in Railway issues was maintained. The general tendency, however, was still very disappointing, and Consols fell another $\frac{3}{16}$. Saturday was very quiet, but rather steadier; the political horizon looking calmer. Banks closed lower on last half-year's accounts. In the Money Market, the demand was good, and rates hardened steadily. In the Gas Market, business showed a nice increase in activity; and coupled with the greater volume of transactions there was a gratifying improvement in prices. Prominently identified with both these features was the Gaslight and Coke Company—animated by the announced reduction in the price of gas, which will increase the divisible rate of dividend to £4 13s. 4d. per cent. The result was that the ordinary stock, which was done at 99⅞ on Monday, closed on Saturday with a mark of 101⅝—a rise of 1½ in the quotation. The secured issues profited too; the maximum marking from 89¾ to 90½ (a rise of ½), the preference from 106½ to 107⅛ (a rise of ½), and the debenture 84⅞ and 85⅜. South Metropolitan also gained a point in the week, with dealings ranging from 120½ to 122. The debenture made 85¾. Commercials were very quiet. The 4 per cent. was done at 107½ and 106¼ free; the 3½ per cent. at 103; and the debenture at 81½. In the Suburban and Provincial group business was very limited, but prices were on the rise. Brentford old changed hands at 249 (a rise of 1), ditto debenture at 101½, Alliance old at 18½, Bournemouth preference at 16½, North Middlesex new at 13⅝ free, Tottenham "B" at 106½, and West Ham at 112. In the Continental companies, a noticeable feature was the partial recovery of Union, which marked 100 and 100½ (a rise of 4½); and the preference marked 135½ and 136. Imperial was steady at from 179 to 180½, ditto debenture at 96 and 95 free, and European fully-paid at from 24 to 24⅛. Tuscan was weaker at 9. Among the undertakings of the remoter world, Bombay was done at 5⅝ and 5¾, Buenos Ayres at 11 11/16 and 11¾, Cape Town debenture at 77½, Primitiva at 5 15/16 and 5¾, River Plate at 13⅜ and 13½, and San Paulo at 14.

ELECTRICITY SUPPLY MEMORANDA.

The "Poisonous Fumes" Slander—"Meteor's" Attempt at Justification—The Damaged Chair—Leather and Sulphuric Acid—Coal a Greater Sinner than Gas—Metallic Filament Lamp Voltages, Life, and Efficiencies.

THERE has been reference on more than one occasion lately to the loose assertions that appear in the circulars issued from electricity stations regarding the "poisonous fumes" alleged to result from the use of gas for lighting purposes. The statement has been made with growing frequency; and there is a disposition to go from bad to worse in the matter. Certain of our electrical contemporaries, though we had given them credit for greater wisdom, have flattered by imitation those station engineers who, in their literature, are constantly certifying their lamentable ignorance; one paper, indeed, going so far a few weeks since as to describe gas as a "deadly agent." Not content with naked statement, the asserted iniquitous effects of gas are maliciously printed in glaring colours on wall posters, portraying ladies suffering extreme lassitude and cats and parrots in fearfully seedy condition—the supposed result of sitting in gas-lighted rooms and inhaling the so-called "poisonous fumes." We have been curious to ascertain what those who are responsible for these statements and pictorial posters mean by the "poisonous fumes" that emanate from the use of gas for lighting purposes, and what evidence they have, statistical or otherwise, that the use of gas is detrimental to health. To satisfy this curiosity, we have asked electrical engineers for information, and have tried to spur them into reply. But from them nothing has been forthcoming in justification of statement. If it cannot be justified, then, of course, it is a miserable and contemptible slander.

"Meteor" of the "Electrical Times" has done good service on two or three occasions by indirectly pointing out the poverty of the electrical land in justification for the assaults upon gas. It was "Meteor" who declared that the pictorial posters of the Associated Municipal Electrical Engineers are more highly coloured than life (which is another way of saying that they exceed the bounds of truth). It was the same "Meteor" who the other week hinted that there was not much *kudos* to be gained from advertising the fact that metallic filament lamps could beat the old-fashioned and wasteful form of flat-flame gas lighting to be found in many of our cathedrals and churches. And now it is "Meteor" who valiantly comes to the assistance of the central station engineers, who cannot themselves find a reply to the inquiry as to what they mean by the "poisonous fumes" evolved by a bunsen flame used for incandescing a gas-mantle; and he has again—unintentionally this time—shown the paltry character of the backing that the central station engineer has for his malignant aspersions, which he has not the courage to endeavour to justify. "Meteor" has got among the pharmaceutists, and with unfeigned triumph points to the abstract of the little paper and discussion on "Sulphur Compounds in Coal Gas," before the North British Branch of the Pharmaceutical Society, as published in the "JOURNAL" for the 22nd ult. The whole of the discussion was full of "ifs" and "doubts," and there was nothing conclusive about it. But the part of the paper that "Meteor" has seized hold of with great avidity to prove the existence of "poisonous fumes" where gas is used for lighting purposes is as follows:

> **A leather-covered chair which stood near a fair-sized gas-stove became damaged on the surface. On examination, the leather gave a strong acid reaction, and the washings from it gave an abundant precipitate with barium chloride. Of course, it might be said that the acid might have another origin than the burning gas; but this theory was rather negatived by the fact that coverings of the same kind in another room had not suffered.**

This is an extremely interesting paragraph, "Meteor;" and let us reason it out together. There is certain information missing from it that would have been of great assistance in discussing its submissions. Nothing is said as to whether there were any other leather-covered chairs in the room where the damaged one was found; nor is it stated whether, in the second room where similar chair coverings were not found damaged, gas was being used for lighting. We must therefore confine ourselves to the statements in the paragraph. The damaged leather-covered chair stood near to a "fair-sized" gas-stove. If that gas-stove was properly fitted, the products of combustion would all ascend the chimney, and we have little doubt they did in this case. If the draught is not up the chimney but down into the room, a gas or coal fire would be unbearable in any apartment; and there is no evidence in the paper of any personal inconvenience. The gas-stove, we are told, was a fair-sized one; and that the chair stood near it. A "fair-sized" gas-stove gives out a large amount of heat; and a leather-covered chair standing near to any fire (whatever the fuel used) giving out a large amount of heat would become damaged, and the leather would perish. If we may suppose—it is not at all improbable—that this was not the only leather-covered chair in the room, and that the others did not show the same amount of damage, then—assuming for the sake of argument that "fumes" from the gas-fire did the damage—this particular chair must have had a phenomenally magnetic influence for the fumes, absorbed them, and so prevented their free circulation about the room. Otherwise, there would be no explanation as to why the other chairs escaped similar affliction. The evidence, in our opinion, points more to the damage being occasioned by heat owing to the proximity of the chair to the fire than to any escaping fumes. Leather-covered chairs [in the writer's possession] that have been in use in a gas-lighted dining-room for more than twenty years, show no signs of deterioration beyond the wear and tear one would naturally expect from daily use.

There is a significant statement in the paragraph. "On examination, the leather [of the chair near the "fair-sized" gas-stove] gave a strong acid reaction. . . . It might be said that the acid might have another origin than the burning gas; but this theory is rather negatived by the fact that coverings of the same kind in another room had not suffered." Here we are not told whether the coverings of the chairs "in another room" were tested for acid; but the information is merely given that the coverings had not suffered damage in the same way. We take this to mean observable damage similar to that of the leather-covered chair that stood near the fair-sized gas-stove, and which was probably caused by the perishing of the leather through the heat to which it was exposed.

But let us now leave the pharmaceutists, and quote some testimony on this very question of certain men of high position in the scientific world, as placed before the Departmental Committee on Gas Testing over which Lord Rayleigh presided in 1904. In this case, book-binding leathers were referred to—such leathers coming more than chair coverings into the range of the so-called "poisonous fumes" that electricians assert arise from gas lighting. No one will question the independence and authority of Mr. A. G. Vernon Harcourt, F.R.S., D.C.L., who was not a witness for the Gas Companies. He stated that he had been into the matter very carefully, and could not find that injury to leather bindings of books in a library was due to the sulphurous acid to be found there. "Certainly there was damage to the books in the library; and there was sulphurous acid in the air. But acid might have been used in dressing the leather, which would account for the damage. The finding of sulphuric acid in the leather of the books in the library did not prove that it had come into the leather from the gas in the room." He said further: "At one time when I had a stronger opinion than now as to the possible mischief of the presence of sulphur in gas, I went into the matter rather carefully; and I confess that I did not satisfy myself that there was any very strong case against such an amount of sulphur as is now allowed in London gas." Then

Dr. J. Gordon Parker, whose authority on leather will hardly be disputed by the electricians, said: "It is not sufficient to find free sulphuric acid in leather to put gas down as being the cause of decay, as sulphuric acid is frequently used both in bleaching the leather and in the dying process by the manufacturers." Asked by Dr. Farquharson (one of the members of the Departmental Committee) how he explained that leather book coverings deteriorated in libraries where no gas was used, Dr. Gordon Parker replied that he should say sulphuric acid was used to bring out the colours of the aniline dyes. The process, he also explained, was to scour and bleach with sulphuric acid; the dye stuffs themselves being developed by formic acid, or acetic acid, or lactic acid. Some leathers, he added, contain from 0·1 to 0·4, 0·5, and (sometimes he had found) 0·7 per cent. of sulphuric acid. We shall be obliged if "Meteor" and our other electrical friends will consider these points in connection with our submission as to the damage to the leather covering of the chair near the fair-sized gas-fire being occasioned by heat.

There was another point in connection with the paper before the Edinburgh pharmaceutists, which it is surprising "Meteor" did not lay hold of. "On *one* occasion," the authors state, "we obtained 0·2 gramme of sulphuric acid from 130 cubic feet of gas. Taking the consumption of gas in one year at 2,075,828,000 cubic feet, this would represent 3 tons of sulphuric acid produced by burning the gas of the Gas Commission in a year." What follows is particularly worthy of note: "If we add to this the large amount of sulphuric acid sent into the air by burning coal, the atmosphere of the city and neighbourhood must receive a large supply of this deleterious and corrosive compound." But what a small proportion that 3 tons from the gas used over a whole year in Edinburgh, Leith, and the district represents to the total amount discharged into the atmosphere by the burning of coal. The people of Edinburgh, Leith, and district have really something for which to thank the Commissioners in relieving their atmosphere of a goodly quantity of sulphuric acid. As has been pointed out before in the "JOURNAL," some gas coals contain as much as 35 lbs. of sulphur per ton; but in the process of gas manufacture and purification, this is all removed, excepting, according to the system of purification (say) 0·3 lb. to 0·7 lb. So that the contribution of gas to the amount of sulphuric acid discharged into the atmosphere through the burning of coal is very small indeed. Having regard to these figures, it would be interesting if "Meteor" would set himself to ascertain what amount of the "deleterious and corrosive compound" the chimneys of (say) the Edinburgh and Leith electricity generating-stations really emit in the course of a year, through using coal containing 1 per cent. and upwards of sulphur, to the detriment of the surrounding neighbourhood.

It has been one of the well-advertised advantages of metallic electric lamps that they are much less susceptible to variation of voltage than the old carbon filament lamps. The general statement, however, does not give any real indication of the extent to which erratic or excess beyond the rated voltage has influence on the life and efficiencies of the lamps. Advertised efficiencies are those obtained under the protected and regulated conditions of the laboratory, and not with lamps on the district electricity supply system. This was a matter to which attention was drawn by Mr. J. Findlay, in a paper read before the Rugby Engineering Society, from which some particulars were given in the "Memoranda" a fortnight since. Corroborative evidence is found in a paper before the German Association of Electrical Engineers. Life tests on a considerable number of Osram lamps showed that, at normal voltage, lamps broke at the end of about 1000 hours, after having lost only 7 per cent. of their initial candle power. At 105 per cent. of the normal voltage, lamps dropped to 80 per cent. of their initial candle power in 900 hours. At 110 per cent. of the normal voltage, they dropped to 80 per cent. in 370 hours. At 115 per cent. of the normal voltage, they dropped to this value in 210 hours; at 120 per cent., in 125 hours; and at 125 per cent., in 70 hours. When burned above normal voltage, therefore, the lamps would have to be taken down and renewed sooner than otherwise because of loss of candle power; but when burned at or below normal voltage, they may be retained in use until they break. In connection with the spherical candle power and consumption of various electric lamps at present in use, it may be of assistance to have on record the following particulars included by Mr. Findlay in his paper.

Lamp.	Mean Spherical Candle Power.	Watts per Candle.	Candles per Kilowatt.
56 watt (16 h.c.p.) carbon filament incandescent lamp rated at 3·5 watts per c.p. . .	13·2	4·24	236
50 watt (16 h.c.p.) carbon filament incandescent lamp rated at 3·1 watts per c.p. . .	13·2	3·78	264
Three-glower, 264 watt Nernst lamp . . .	81·0	3·26	307
"Gem" 125 watt (50 h.c.p.) graphitized carbon filament lamp	40·7	3·07	326
40 watt "Tantalum" lamp rated at 20 h.c.p.	14·5	2·75	328
Direct current 5·1 amp. enclosed arc on 110 volt circuit 1·5-inch carbons	213·0	2·63	380
Alternating current enclosed 5·7 amp. arc, taking 388 watts on 110 volt circuit 5-inch carbons	152·0	2·55	392
60 watt 110 volt tungsten filament lamp, burning at 1·25 watts per h.c.p.	37·0	1·62	617

GAS BILLS FOR 1909.

SECOND ARTICLE.

THE Bills that are being promoted by statutory Gas Companies afford the material for the second portion of our review of the gas legislation projected for the ensuing session of Parliament.

The Aldershot Gas and Water Company are proposing to extend their field of operations in several ways, but chiefly by obtaining authorization to purchase, under agreements already entered into, the Hartley Wintney Gas Company, Limited, and the Odiham Gas Company, Limited, and by an extension of the limits of supply, including Ash, within which parish the Ascot Gas Company have, under their Act of 1882, powers of supply, but which powers the present promoters ask shall be repealed. Turning first to the schedules of the Bill, it is seen that the sum to be paid to the Hartley Wintney Company for their undertaking and property is £3000, and to the Odiham Company £1600, exclusive of stocks and stores. The transfer, in both instances, is to take place on Sept. 29. Regarding general matters, there are several additional parishes named, in the counties of Surrey and Southampton, which the Company are desirous of bringing within their area of supply. In these parishes, it is proposed that the price to be charged shall never be more than 1s. 6d., nor for a period of seven years from the passing of the Act less than 1s., per 1000 cubic feet in excess of the price for the time being charged in Aldershot. A clause which suggests contention in the Committee rooms is this:

Notwithstanding anything in section 27 of the Order of 1903 contained, if and whenever the price charged by the Company for gas supplied by them to persons who shall burn the same by meter shall be less than the price charged under like circumstances by the Yorktown and Blackwater Gas Company, the Company shall be entitled to give a supply of gas to any authority, company, or person requiring the same within the part of their district within which the Yorktown and Blackwater Gas Company are authorized to supply gas; and the Company shall be entitled to expend capital and moneys for that purpose.

The promoters are also asking for sanction to the supply of "power gas," exempt from the provisions applying to gas for other purposes in respect of illuminating power, pressure, purity, testing, and price, under the conditions and regulations that have, in recent sessions, been imposed in connection with such service. In a special section of the Bill, the Company seek electric lighting powers, in connection therewith defining a district of supply, asking permission to use certain lands already in possession for the generating plant, and putting upon themselves the obligation —before the expiration of three years after the passing of the Act, without being required to do so—to lay reasonably suitable and sufficient distributing mains for the purposes of general supply throughout the streets or in part of the streets specified in one of the schedules, with power to the Board of Trade to extend the time-limit. Among the electrical clauses is one giving protection to the Company in respect of the supply of electricity where the consumer has a separate service. The Company are proposing to change their name to the somewhat cumbrous one of the Aldershot Gas, Water, and District Lighting Company. A capital consolidation scheme is incorporated in the Bill; the variety of classes into which the existing shares are divided making the proposal a necessary one in order to produce simplification. It is contemplated to convert 2500 ordinary £10 "A" shares into £50,000 of "A" consolidated stock; 500 "B" £10 shares into £10,000 "B" stock; 850 £10 "E" shares, 2801 ordinary £10 "F" shares, and 1965 £10 "G" shares, into £78,624 "C" stock; 2000 preference "C" shares, 1437 preference "D" shares, 3856 preference "E" shares, 1000 "F" shares, 1918 preference "G" shares, and £4500 of preference stock, into £141,855 of consolidated preference stock. Unissued capital, under the Order of 1903, is, it is contemplated, to be raised as "C" consolidated stock. As to standard dividend, the "A" stock is to be entitled to 5 per cent. per annum, and the "B" to 3½ per cent. The "C" stock is to be entitled to a maximum of 5 per cent. per annum; and the consolidated preference stock, to 4 per cent. As heretofore, the standard price is to be 3s. 8d.; but the operation of the sliding-scale is to be altered so that, in respect of any half year, penny increases above or reductions below the standard will carry decreases or increases of dividend at the rate of 9d. per cent. on the "A" and "B" consolidated stocks. Additional capital powers to the amount of £200,000 are sought; the money to be raised as "C" or preference stocks. Provision is made for the offering of stock to consumers or employees; and in the case of that offered for sale by auction or tender, the new auction clause of last session is to apply. Borrowing powers are proposed on the one-third scale. The special purposes fund clause is adopted. The Company also desire power to construct an additional tramroad. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

By the preamble of their Bill, it is seen that the Alliance and Dublin Consumers' Gas Company have raised £589,944 by the issue under their 1866 Act of 59,000 shares of £10 each, bearing a dividend at the rate of 10 per cent. per annum; £49,962 by the issue, under the 1874 Act, of 5000 £10 shares, bearing a dividend at the rate of 7 per cent. per annum; and £249,009 by the issue, under the 1883 Act, of 18,500 £10 shares, entitled to a dividend of 7 per cent. Debenture stock to the amount of £310,000, and entitled to 4 per cent. interest, has also been raised. The various classes of ordinary capital it is now proposed to convert into a

stock of the nominal amount of £1,509,000, bearing a uniform dividend of 5 per cent. This will be divided between the holders of shares entitled to a dividend at the rate of 10 per cent. in the ratio of £20 of stock for each share held, and between those who possess shares entitled to a 7 per cent. dividend in the proportion of £14 of stock for each share. The sliding-scale will be altered to meet the new circumstances. Additional capital is proposed, not exceeding in the whole £400,000. The capital will be subject to the new auction clause. In addition to the sum of £310,000 already raised, the Company propose power to borrow, in respect of existing ordinary capital, £58,256, and one-third on the additional capital. A special purposes fund is provided for. In respect of profits, the carry-forward is not in any case to exceed the sum required to pay a year's dividend at the authorized rate. Regarding other matters, it is observed that the necessary extension of section 13 of the Gas-Works Clauses Act of 1847 is to be made, in order to give liberty in the matter of the terms on which gas is supplied. With a view to facilitating the transference of coal and materials to and from vessels alongside the quays adjacent to the Company's works on the River Liffey, the promoters desire power to construct further works, to be completed within the next five years. The present gas-works are built upon lands held by the Company upon leases which, in some cases, have a comparatively short period to run; and therefore the Company are asking authority to acquire the outstanding interests in the site, and also to purchase other lands for manufacturing purposes. Certain parishes and places not now within the limits of supply are intended to be brought in. The Company are proposing a 14-candle gas standard, with tests by the "Metropolitan" No. 2 burner and the Harcourt 10-candle pentane lamp. The Company offer to bind themselves to supply, at any time within twelve months of the passing of the Act, flat-flame burners suitable to the gas of lower illuminating power. According to precedent, the Company, being one of the few remaining ones subject to penalty or forfeiture by reason of the presence in the gas supplied of sulphur impurities other than sulphuretted hydrogen, desire exemption. It is further proposed to reduce the interest on money deposited as security for gas, meter, &c., from 5 to 4 per cent. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bill of the Eastbourne Gas Company is not of an extensive order. The preamble informs one that the original and "C" shares (with 10 per cent. dividend) together amount to £32,500; that the "B" shares (7 per cent. dividend) amount to £94,000; and that the premium capital amounts to £55,706. The total paid-up capital, therefore, is £182,205; leaving authorized but unissued share capital to the amount of £30,294. The Company have no mortgage or debenture debt, and have unexercised borrowing powers to the extent of £37,500. The Company are desirous that the ordinary share capital should be converted into stock of two classes, to be called "A" and "B" stock, with standard rates of dividend respectively of 5 and 3½ per cent. The holders of shares, it is proposed, shall receive £20 of stock for every £10 share. The provisions of the sliding-scale will be altered to meet the new conditons. Power is required to raise any unissued capital either as "B" or preference stock. It is contemplated to extend the limits of supply so as to embrace several new parishes; and awaiting the confirmation of Parliament is an agreement with the Hailsham Gas Company for the purchase of their property. The agreement provides for the issue to the shareholders of the Hailsham Company of 5 per cent. preference stock to the amount of £3150; the division to be made among the shareholders at the rate of £15 of preference stock for each £10 share held by them. The Hailsham Provisional Order of 1903 is then to be repealed. Power is to be taken to create a special purposes fund. The Company also desire to be up-to-date in the matter of testing for illuminating power. Regarding discounts, the adoption of the old 10 and 15 per cent. clause is proposed, instead of the more open plan of extending section 13 of the Gas-Works Clauses Act, 1847. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The provisions of the Gaslight and Coke Company's Bill, which proposes *inter alia* the transfer of the West Ham Gas Company's undertaking and the reduction of the illuminating power of the gas to 14 candles, were noticed at length in our issue for the 22nd ult., p. 840. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The extension of their district is contemplated by the Harrogate Gas Company; and in connection therewith, they are taking power to acquire by agreement with, or take on lease from, the owner certain gas-works in the parish of Birstwith, and continue or dispose of them as thought fit. The Company have constructed a railway from their works communicating with the North-Eastern Railway; and they ask that sanction and confirmation should be given to the construction and use of the railway. For the grant by the borough of an easement or right of constructing the railway over a part of the Bilton sewage farm, authorization is also desired. Sanction and confirmation are further asked to the construction of certain subways by the Company under the Ripon Road connecting the portions of the works severed by the road. The promoters also ask for further railway powers, and for authority to the Corporation to grant them easements for the purpose. There is also provision for a little co-operative work between the Company and the Corporation, by which the sidings of the former and their means of haulage may be used, as a matter of business agreement, for the delivery by the Company of the coal required for the Corporation electricity works, which are situated near the gas-works. Arrangements are also made regarding the construction of the necessary works for this object. These works form an important section of the Bill. Lands are also scheduled, for purchase by agreement with the Corporation, for gas-works purposes. The powers of the Company under section 11 of their 1897 Order relating to the sale of shares or stock by auction or tender are proposed to be extended, so as to authorize unsold shares or stock, when offered for sale by auction or tender, being offered at a reserve price to the holders of ordinary or preference shares and to the Company's employees and consumers of gas. Power is to be taken to create a special purposes fund. An interesting clause of the Bill is the following:—

> It shall be lawful for the Company in any part of the limits of supply, in or through which they shall not have laid mains for the supply of gas, to provide, fit up, work, and use independent installations, plant, fittings, apparatus, and works for the generation, supply, and use of acetylene, gasolene, or suction gas, or any other gas which can be conveniently generated for such purposes; and the Company may provide and sell, or let for hire, engines, motors, dynamos, generating and other apparatus, stoves, ranges, pipes, fittings, and appliances necessary or convenient for the purposes of any such independent installation, and the supply, use, or consumption of gas generated thereat.

Then, for the removal of doubts, it is hereby declared that the expression "the lowest price charged for the time being by the Company to any private consumer" in section 63 [Regulating the Supply of Gas and Price for Public Lamps] of the Act of 1863 means the lowest price charged for gas supplied for lighting purposes. Other provisions worth noting are two proposing further amendment of existing conditions. The one is that, notwithstanding anything contained in section 66 [Company to Supply Gas in Certain Events at Request of Owner or Occupier] of the 1863 Act, "it shall be lawful for the Company in any case in which they may think fit so to do, to provide at their own expense the whole or any part of so much of any service-pipe as shall be laid upon private property, or as shall be laid beyond 30 feet in length." The second is that, "notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give a supply of gas for any purpose other than lighting in any case where the capacity of the main of the Company from which the supply is required to be given is insufficient for such purpose, or if and so long as any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied for lighting purposes. [*Parliamentary Agents: Messrs. Dyson and Co.*]

INVERTED GAS OR METALLIC ELECTRIC LAMPS FOR PUBLIC LIGHTING.

In many places where there is a municipal supply of electricity, there has already set in a critical struggle between the metallic filament lamp and incandescent gas-burner for the lighting of the secondary main roads and side thoroughfares in which electric cables have been laid. If dealt with on the commercial basis—that is to say, electricity doing the work of illumination at a price that will result in a profit, never mind how small—incandescent gas-burners, especially those of the inverted type, can offer to the ratepayers economy in contrast with the metallic filaments, with moreover a superior efficiency in fair or foul weather.

It may be remembered, from the occasional references that have been made to the matter in our columns, that among the local authorities who have been considering the question of converting a number of street lamps now fitted with upright incandescent gas-burners to the electric metallic filament system, are the Beckenham District Council; and they have got so far as to ask the Local Government Board for a loan for the purpose. But as has been seen from the reports of the Borough Council meetings, the South Suburban Gas Company stepped in, and asked that at least, before anything further was done in the matter, they should have the privilege and justice done them of being allowed to demonstrate by direct comparison with metallic filament lamps what could now be done in street illumination by ordinary pressure inverted gas-burners. The Council are the owners of the electricity works, but they are not so oblivious as are some local authorities to their duty to the ratepayers that they could decline the request of the Gas Company. The direct experiment has therefore been carried out; and though, up to the time of writing, the Council have not come to any determination in the matter, it is learned from the "Beckenham Journal" that the lighting by the inverted gas-burners has "very favourably impressed many people, and at the present time the Council are negotiating with the Gas Company on a proposal which, after all, may mean the retention of gas lighting in an improved form." It is a satisfaction to know that a demonstration of the kind has evoked public interest, and still more so that the public verdict—whatever that of the Council may eventually be—is favourable to inverted gas-burners in comparison with metallic filaments.

The local interest in the demonstration induced a representative of the "Journal" to pay a visit to Beckenham last Wednesday night to see what was being done. The demonstration is being made in the Beckenham Road, in a part skirted by private residences, with gardens in front outlined with trees. The situation is therefore eminently suited for a trial of the kind, as the lamps

as illuminating agents have to stand entirely on their own merits. Wednesday night, too, is a particularly favourable night for inspecting generally the lighting arrangements of the district, as it is "early closing" night for the shops; and therefore all the public lighting can be judged solely on its own merits. Last Wednesday, furthermore, the atmosphere was fairly well charged with mist; and it is when mists and fogs prevail that there can be the test for greatest efficiency. That test nothing that electricity has as yet done gas is at all afraid to meet. From the time of the South Foreland lighthouse experiments years ago down to the present, experts and mariners have testified to gas having a greater penetrating power than electric light in fogs; among the more recent notable expert testimony being at the official inquiry at Liverpool, some two to three years since, into the loss of the White Star liner *Suevic*. What is true at sea is true on land; and every foggy day affords some additional evidence.

From Beckenham Junction Station, then, on a Wednesday night, when shops are closed, a walk along the main road through the old village to the Beckenham Road and up to the Clock House Station is extremely interesting to the student of public lighting. From Beckenham Junction Station to the end of the shopping part of the district where Beckenham Road commences, flame arc lamps are in use; and it is an excellent illustration, without the shops to lighten the darkness between the lamps, of disuniform illumination. There is a flood of light under the flickering flame arc lamps, which intensifies the darkness of the road surface between. It is an example of the inefficiency of high-power light sources with low diffusive ability in producing consistent illumination in our public ways. At one corner of a side thoroughfare, outside the London and County Bank, there is a double-burnered inverted gas-light; and between the amount of light on the road surface and pavement on that side of the street and the opposite where there is a flame arc lamp, there is not much to choose. But we undertake to say there is in the matter of the actual cost of the two illuminating agents. At the beginning of the Beckenham Road up to Clock House Station it is almost a straight thoroughfare; and one can examine the various types of lighting for good stretches either way both in perspective or in the immediate neighbourhood of the lamps. First, there are upright incandescent gas-burners; then five double inverted burner lamps (set on the common hit-and-miss principle); then five single inverted burner lamps; and finally half-a-dozen electric metallic filament burners. The inverted gas-burners used here are of Mr. Charles Carpenter's design; and the beautiful incandescence of the mantles and the intensely penetrating light, one could not fail to admire. The upright incandescent burners have, judging by their appearance, been in use some years; so that they are hardly exponents of the illuminating power of the most modern productions in ordinary vertical burners. But there can be no doubt that an upright burner would have to be an extremely good one to compete with the effect that is obtained from the inverted burnered lamps. In the portion of road lighted by the double burners, there is along the surface a greater uniformity, and therefore an absence of such marked patchiness in light and shade, than there is where the flame arc lamps stand. From garden fence to garden fence and lengthwise of the road (the lamp columns are not so far apart, this being a main road, as they usually are in side streets), the illumination is excellent with the double-burnered lamps; and where the lamps are of the single-burner type, there the illuminating power is distinctly superior to that afforded by the neighbouring metallic filaments. Increased illuminating efficiency (and we mean "efficiency" to comprehend distribution and not concentration) should, as a matter of course, follow increased expenditure in obtaining it, which it does not, in proportion to the expenditure, when flame arcs are employed. When metallic filaments are viewed independently of all other lights, they appear to give a perfectly white light; but when viewed in juxta-position with the white penetrating light of the inverted gas-burners on a misty night in the Beckenham Road, the mist about the lamp seems to have an orange tint imparted to it by the light rays. The light from the lamps is distinctly more concentrated than that from the inverted gas-burners; and certainly its penetrating power is not so good, nor is the road-surface illumination. Like many of the people of Beckenham, we are also, from inspection, impressed very favourably with the inverted incandescent gas-lamps, and are confirmed by the trial in our former judgment of their great superiority over metallic filaments for public lighting, as for other, purposes.

Daylight Saving Bill to be Revived.—It is stated that Mr. Robert Pearce, M.P., will introduce another Daylight Saving Bill next session. It will be drafted on the lines of the recommendation of the Select Committee on its predecessor, and will propose an alteration of an hour on a Sunday in April and September, instead of an alteration of 20 minutes on four Sundays in each month, as was originally suggested by Mr. Willett, the originator of the scheme. The President of the Board of Trade (Mr. Winston Churchill) has promised to see Mr. Willett and discuss the matter. The object is to meet the objection to the proposal raised by the Stock Exchange and the Liverpool Cotton Exchange, who pointed out that if English time is altered by an hour it will destroy the advantages of having the markets of this country and New York open simultaneously for an hour a day. Mr. Willett hopes that the difficulty will be surmounted by the United States adopting a Daylight Saving Bill of their own.

THE RUIN OF MESSINA.

More Cheerful Report as to the Gas-Works Staff and Plant.

DISTRESSING as has been the loss of life, we have more cheerful news to publish this week regarding the staff and works of the Continental Union Gas Company in the wrecked and mourning city of Messina. So far as it goes, what has now to be related, as the result of a report received by Mr. W. Martin, the Secretary of the Company, from M. Lacombe, the Agent-General, will do something towards relieving the anxiety of those who are associated with the undertaking, both at home and abroad.

Fig. 1.—Remains of One of the Retort-Houses.
The chimney shaft is broken off just above the top of the picture; and it was the falling top of this chimney that ruined the house.

So far as the destruction of the town is concerned, M. Lacombe says that the state of affairs is indeed fully as bad as words have enabled the newspapers to represent; but so far as the staff and works of the Company are concerned, the earlier reports that were dispatched from various sources, in the first stages of panic in the town, were somewhat exaggerated. The Company's building, in which the Manager (Mr. F. Ruggeri) and his family dwelt, and in which were situated the offices, the shop for the sale of fittings, &c., a small electrical installation, and the lamplighters' quarters, is completely in ruins; and the Manager and his family are still buried beneath the heavy mass of fallen *débris*. The building was a large and extensive place, three-storeyed, and substantially built—quite as massive (says Mr. Martin) as the building in which are the Company's London

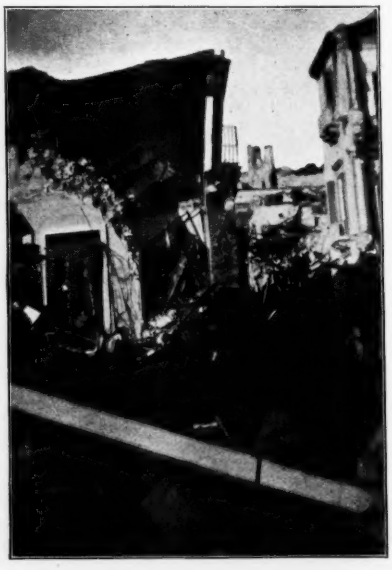


Fig. 2.—The Wrecked Offices and Manager's Dwelling.
Beneath these ruins Mr. Ruggeri is buried.

offices in Drapers' Gardens. The building came down with a run; it being situated in the very centre of the seismic wave. With regard to the staff and workmen, the names of about sixteen clerks out of the thirty have now been received as having escaped death, and of about 80 workmen out of the 200 or so to whom the business gave employment. The stokers and others of the works' men are nearly all saved, because they mostly lived in the

country; the section of workmen who appear to have suffered most being the lamplighters, who were probably on their rounds at the time of the earthquake, and were caught by the falling masonry and other wreckage.

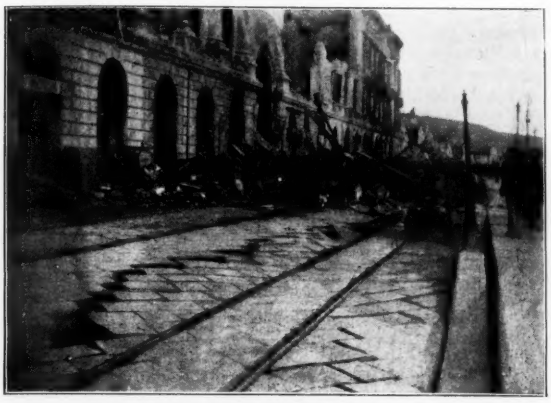


Fig. 3.—Messina Municipal Buildings.

As to the distribution system. The lamp-posts are practically all broken down, and the principal mains and service-pipes have been found fractured in many places.

Respecting the works, they are situated in the northern district on the front, about 1½ miles from the centre of the town; and it

Fig. 4.—A Nearer View of the Part of the Municipal Buildings that suffered most Damage.

was the centre of the town that received the full shock. The works were therefore somewhat distant from the area in which occurred the severest shock and effect. M. Lacombe (who, it will be remembered, was accompanied to Messina by Mr. P. S. Morton, of Genoa) reports that the gasholders and columns are intact; but

Fig. 5.—The Ruins of the British and American Consulates.

the tanks are cracked rather badly. The retort-houses have suffered chiefly through the falling of the chimneys, of which there were three on the works. The roofs were broken in by the falling material, and injury was wrought to the superstructure of the benches—the hydraulic mains, and so on. The roofs of one or two of the other buildings were also broken through, owing to the same cause. The other plant—exhausters, boilers, purifiers, &c.—all seem to be in fairly good condition. The stock of coal, too, at the works has not been washed away as feared, but is still in existence. Therefore, happily, the effect so far as the gas-works are concerned is not nearly so serious as was originally feared from the messages that first came to hand from Messina.

The photographs which accompany this notice were taken by Mr. Morton. They are rather small, and in certain details not very distinct; but they are the best that could at the time be obtained.

THE ECONOMY OF WATER-GAS PRODUCTION IN VERTICAL RETORTS.

In the "Journal" for Nov. 10 last (p. 404) was published an article by Mr. Körting and Dr. Geipert, of Berlin, on the advantages of wet carbonization in vertical retorts. The joint authors sought to demonstrate in the article, from the results of certain trials of the vertical retort installation at Mariendorf, that a real economy was effected by the introduction of steam into the retorts towards the close of the period of carbonization as compared with carbonization without the admission of steam. We drew attention on another page of the same issue of the "Journal" to certain points in which it appeared to us that the demonstration of the alleged economy was not conclusive. Our comments on the subject have now been followed up by a critical discussion on different lines by Professor Strache, of Vienna, in the "Journal für Gasbeleuchtung" of the 2nd inst., of the article by Mr. Körting and Dr. Geipert. We propose to give in the sequel a summary of Professor Strache's arguments, together with a reply which Mr. Körting and Dr. Geipert have made to them in the same issue of our German contemporary.

Professor Strache at the outset states that the theoretical calculations made by Mr. Körting and Dr. Geipert are not in accordance with the practice of water-gas manufacture, because they do not take account of the extent to which the steam is dissociated. For the rational production of water gas, Professor Strache states that it is absolutely essential that there should be approximately complete conversion of the steam into water gas. This can never take place, he says, in the vertical or any other type of retort. Professor Strache then continues as follows.

Even if the improbable assumption of Mr. Körting and Dr. Geipert is granted, that the portions of coke adjacent to the walls of the retort have actually a temperature of 1200°C., a much lower temperature must nevertheless be assumed for the interior of the retort, as there would be neither rhyme nor reason in heating the interior of the retort far above the temperature necessary for the gasification of the coal. It will not be wrong to assume that the temperature prevailing in the interior is at the most 800°C. It cannot be supposed in any case that a higher temperature prevails in the vertical retort than in the lower part of a water-gas generator immediately after the blow. Yet it is in this part of the generator at this time that the dissociation of the steam in a water-gas plant takes place. There cannot therefore be produced in a vertical retort of the same cross section by means of the sensible heat of the coke more gas than would be produced in the run following the blow in a water-gas generator. The quantity of heat stored up in the coke is not therefore available for the continuous dissociation of steam in uniformly favourable conditions, as the surfaces of the pieces of coke are rapidly cooled by the production of gas. The heat of the interior of the pieces of coke needs considerable time to reach the outside, and only does so provided there is a noticeable fall of temperature between the inside and the outside. The temperature of the surfaces of the coke after a short time falls to a point at which a proper dissociation of the steam can no longer take place, even though a temperature of 1000° C. may still prevail in the interior of the individual pieces. This conclusion is arrived at by following the course of dissociation of steam during the run of a water-gas generator. For instance, the following are the quantities of water gas obtainable during a run per square foot of clear cross section of a water-gas generator.

Gas-Works.	System.	Cubic Feet of Water Gas per Square Foot of Area per Run.
Elberfeld (Apparatus I.)	Strache	64·3
,, (,, II.)	Strache	95 1
Pforzheim	Dellwik	83·0
Thyssen and Co. (Mülheim)	European Water Gas Co.	66·9
Itzehoe	Strache	139·4
Dortmund	Dellwik	102·7
Pettau	Strache	91·9
Heidelberg	Humphreys and Glasgow	131·2
Plauen	Dellwik	73·9
Budapest	Humphreys and Glasgow	136·1

It will be seen that even in the plant of highest productivity

the quantity of water gas made per run per square foot of clear cross section does not exceed 139·4 cubic feet. The clear cross section of a vertical retort can be assumed to be 1·29 square feet; and if the steam admitted is decomposed to the same extent as in water-gas plant—namely, about 80 per cent.—a vertical retort should be capable of producing only $139·4 \times 1·29 = 179·8$ cubic feet. If, therefore, the vertical retorts at Mariendorf and elsewhere, with a charge of 580 kilos (11·4 cwt.), produce 2260 cubic feet of water gas per ton of coal, it will be seen that such a quantity can only be obtained if the steam is decomposed in an extremely unfavourable manner. By using a very large excess of steam, it is possible to produce even a small quantity more water gas, although the temperature of the coke may have fallen very low. As the steam is passed into the vertical retorts for 1½ hours, and into the water-gas generators for only 6 to 10 minutes, the quantity of water-gas stated can certainly be produced in the former, though not in a rational manner. Unfortunately, there are no experiments on the decomposition of steam in vertical retorts. Experience gained in water-gas generators shows, however, that with such a great withdrawal of the sensible heat of the charge for water-gas production the quantity of steam passing through the fuel undecomposed must amount to at least 90 per cent., perhaps even 95 per cent. Consequently, the steam required for water-gas production in these conditions must be from ten to twenty times the theoretical quantity.

When water gas is produced in vertical retorts in this manner, the cost of the steam, which has not been taken into account by Mr. Körting and Dr. Geipert, constitutes a very considerable item. When water gas is made in generators in proper conditions for the decomposition of steam, an allowance of 0·1 lb. of steam per square foot of cross section must be reckoned. When, however, the steam is as imperfectly decomposed as in the vertical retorts, at least ten times this allowance must be made—*i.e.*, 312 lbs. will be required per 1000 cubic feet of water gas made. Assuming that the coal consumed in the boilers evaporates eight times its weight of water, the coal consumption merely for producing the steam will amount to 37·4 lbs. per 1000 cubic feet of water gas. The consumption of fuel on this head alone, therefore, is as great as the total consumption of fuel for the production of water gas in proper water-gas plant.

It also seems to be somewhat improbable that the steam will be decomposed by the scurf which is deposited on the walls of the retort instead of by the more porous coke. The steam introduced into vertical retorts would rather conduce merely to a scaling-off of the scurf as a result of the changes of temperature caused thereby; but in any case the consumption of carbon must not be taken as involving no cost, because the carbon of the scurf has at least the same value as carbon in the form of coke. Finally, Professor Strache points out that the cost of the installation of a water-gas plant of a productive capacity of 15,000 cubic metres (530,000 cubic feet) per diem, as assumed, he says, by Mr. Körting and Dr. Geipert—viz., £8500—refers to a carburetted water-gas plant, whereas a plant for producing uncarburetted water gas would be obtainable at half the cost. For the comparison in question, clearly only the cost of plant for making uncarburetted gas must be taken. The repairs charged at £350 per annum also refer to a carburetted water-gas plant, and would not be approached with plant for making uncarburetted water gas. Finally, Professor Strache thinks it should not be forgotten that a special water-gas plant is of great value in dealing with strikes, whether of gas workers or of coal miners, both on account of the ease with which it may be operated by the engineers, and the fact that it consumes coke and not coal.

Mr. Körting and Dr. Geipert commence their reply to Professor Strache's criticisms by asking why it should be necessary to introduce into the discussion theoretical considerations which lead to remarkable conclusions, when some of the assumptions made do not the least agree with practice. They prefer to adhere strictly to the conditions obtaining in actual work. They then proceed as follows: The consumption of steam in vertical retorts is absolutely under control and, if necessary, may be measured. The steam is maintained almost at exactly the same low pressure—viz., rather less than 20·3 lbs. per square inch; and it passes through a disc, with a circular hole of precisely determined diameter, inserted in the pipe leading to the retort. Consequently the amount of steam admitted to the retort on the working scale may be regarded as sufficiently uniform for all practical purposes. The consumption of steam may be ascertained by condensing the steam escaping through such a disc, and weighing the water obtained. Five determinations made in this manner showed that on the average 21·5 lbs. of steam entered each retort per hour; the variations being only small. Earlier reports showed that 2476 cubic feet of water gas at 60° Fahr. and 30 inches barometer are produced in the vertical retorts per ton of coal carbonized. The production of water gas extends over a period of 140 minutes. Consequently, the make of water gas per hour is 1060 cubic feet; and the consumption of steam amounts to 35·4 lbs. per 1000 cubic feet of water gas made. In water-gas plant, the consumption of steam, including that for driving the fans, which are not required with the vertical retorts, amounts to 62·4 lbs. per 1000 cubic feet. Therefore, the vertical retorts save 27 lbs. of steam per 1000 cubic feet of water gas made, or, per retort per annum (300 working days), about 123 tons of steam, which is equivalent to a consumption of coke under the boilers of about 15 tons, having a value (in Germany) of about £15.

Having regard to the foregoing experimental results, it appears somewhat superfluous to discuss more fully Professor Strache's criticisms. It may, however, be pointed out that he clearly overlooks three points—viz: (1) The cross section of the vertical retort at its hottest zone is double that which he assumes. (2) The height of the column of coke in the vertical retort is several times that of the bed of coke in a water-gas generator. (3) Heat is constantly being conveyed from the exterior into the retorts while water-gas production is proceeding. All three points must exercise a favourable influence on the production of water gas. There is evidence in support of the assumption that the carbon of the scurf on the hot walls of the retorts actually participates in the production of water gas. It is also quite correct to regard this scurf as costing nothing, on account of the saving of the steam which would otherwise be consumed in scurfing. It would be absurd to work on the walls of the retorts with chisels, and so impair their durability and smoothness, merely to obtain a few pieces of scurf.

Professor Strache's views on the part which water gas might play in strikes have long been refuted. It is well known that it would be impossible on any day to substitute water gas for coal gas, because the whole of the burners supplied would at once be rendered useless. The vertical retorts, moreover, need considerably less service than water-gas plant. Hence, conversely, in a modern gas-works in the event of a strike it might be necessary to forego the manufacture of water gas. In that case steam would be blown into the vertical retorts for a somewhat longer period. As to a strike of miners, gas-works have already coal-stores as security against temporary failure of coal supplies for any reason. If ample coal storage were not provided and reliance were placed on water gas as an auxiliary in case of need, gas-works would soon be brought into discredit with their consumers, as the delicate modern burners are affected by fluctuations of more than 3 to 4 per cent. in the calorific value and the specific gravity of the gas. The cost of water-gas plant was not assumed, as Professor Strache erroneously states, to be £8500, but one-half this sum. The allowance for repairs is, in fact, the average of the actual expenditure over several years.

In these circumstances, it would seem, Mr. Korting and Dr. Geipert say in conclusion, that in future there will scarcely be any use for a simple water-gas plant where vertical retorts are installed. It is another question whether it may not be advantageous and economical to add to the gas a certain percentage of carburetted water gas. When the prices of coke and oil are low, and there is a bad demand for coke, such manufacture of carburetted water gas can certainly be recommended; but at the prices for coke and oil now prevailing (in Germany), carburetted water gas of the same calorific value costs at least double as much as the mixed gas from vertical retorts.

PERSONAL.

Mr. WALTER FROST has been appointed Manager of the Urban District Council of Matlock Bath and Scarthin Nick Gas Department, in place of Mr. W. Jaffray, who occupied the dual position of Surveyor and Gas and Water Engineer.

The Directors of the Swansea Gas Company have appointed Mr. GEORGE THORNTON ANDREWS Engineer and Secretary of the Company, to succeed to his late father. He was for some years Assistant-Manager; and in 1903, when his father relinquished certain of his duties, he was raised to the position of Manager. His experience and his long connection with the Company therefore specially qualify him to undertake the additional responsibility with which the Directors have entrusted him.

A deputation from Alexandria has waited upon Mr. WILLIAM CURRIE, formerly the Gas Manager there, at his residence in Paisley, and presented him with a deposit receipt for £144. The presentation was made by Mr. John Kinnear. Mr. Currie was Manager to the Vale of Leven Gas Company for twelve years, during which period he did much good work in the district. He retired some time ago on account of failing health. The gift was from his friends both within and outside the Vale of Leven.

Mr. C. CARRINGTON BARBER, who was for two years Chemist at the Windsor Street Gas-Works of the Birmingham Corporation, was recently appointed Junior Assistant Engineer to Mr. Walter Chaney, the Engineer-in-Charge of the Nechells and Adderley Street works. At the present time he is engaged in superintending the erection of a new retort-house at Adderley Street. It may be remembered that the construction of this house was taken in hand just now partly with the idea of alleviating the prevalent distress in the district owing to lack of employment.

The Assistant Engineership of the Tottenham and Edmonton Gas Company, rendered vacant by Mr. John Terrace having been selected for the position of Engineer and Manager to the Grimsby Gas Company, has been filled by the appointment of Mr. JOSEPH FISHER, who was formerly with the Bristol Gas Company in charge of their Canons' Marsh works, and recently with Messrs. Corbet Woodall and Son. Mr. Fisher is at present in charge of the erection of works for the Imperial Continental Gas Association at Hoboken, Antwerp, where he will be engaged for the next six months. During that period Mr. E. H. HARMAN, who was formerly with the Gaslight and Coke Company at Beckton and Fulham, and has been for the past few years with the Birmingham Corporation Gas Department, will undertake the duties.

MUNICIPAL INCOME AND EXPENDITURE.

Statistics from the Annual Local Taxation Returns.

EVERY year it almost seems that some apology is needed for referring to the issue of the Annual Local Taxation Returns, owing to the lateness of the time at which they appear. On the present occasion, this feeling is especially strong, for here we are at the beginning of 1909, and there has only just been published the Blue-Book containing Part V. of the returns, which relates to the accounts of the Councils of Boroughs other than Metropolitan Boroughs for the year 1905-6. Hopelessly out of date, however, as the figures thus are, they constitute the latest available official information in regard to the matters with which they deal; and therefore it is necessary to make the best of them.

As remarked, the statistics refer to the year 1905-6; and the number of boroughs in existence at the end of that period, excluding the City of London and the Metropolitan Boroughs constituted under the provisions of the Local Government Act of 1899, was 326, of which 72 were county boroughs. The changes from the preceding year consist of the constitution of two new boroughs (Wimbledon and Merthyr Tydfil), and the changing of one borough (Southport) into a county borough. The receipts of the councils of boroughs (exclusive of repayments of capital sums utilized in lieu of borrowing and exchequer contribution accounts of county boroughs), for the period referred to was £18,635,316. Of this sum, £6,851,107 was from rates and grants under the Agricultural Rates Act, 1896, and £5,356,942 on account of education. The expenditure (exclusive of that defrayed out of loans or charged to the exchequer contribution accounts of county boroughs, including money passing from one account to another of the same corporation), amounted to £19,502,481, including £9,475,434 spent on account of education. The principal items were tramways and light railways, municipal buildings, other loan charges, police, salaries and superannuation and establishment charges, and public libraries, museums, and schools of science and art. The receipts of borough councils in respect of tramway and light railway undertakings, excluding loans and sums transferred from other accounts in order to meet deficiencies in revenue, were £4,998,348; while the expenditure, excluding loans and transfers to other accounts in aid of rates, came to £4,523,179.

The expenditure during the year by the councils acting as municipal authorities which was charged, or was intended ultimately to be charged, to loan accounts, was £3,322,457; the individual headings being tramways and light railways, education, lunatic asylums, municipal buildings, bridges and ferries, public libraries, museums, &c., and police stations. The total amount of loans actually raised during the year for borough fund purposes was £3,615,183—not including sums borrowed under the Education (Provision of Working Balances) Act, 1903—while the repayments of principal and redemption of stock or annuities, and the total sum paid for interest, came to £3,130,967. The amount outstanding at the close of the year under review in respect of the loans owing by councils for borough fund purposes (including educational debts, and also loans for the repayment of which the new councils were answerable) was £57,745,330. Of this, the tramways and light railways are responsible for £20,885,784, and education for £18,240,723. The sums standing to the credit of sinking funds, loans funds, and redemption funds in connection with outstanding loans at the close of the year under review were £2,655,509.

Now we may turn to the other—and more generally interesting—branch of municipal work, particulars of which are to be found in the tables relating to accounts of the councils other than borough fund accounts. These refer to the work done by councils acting as urban sanitary authorities or urban district councils, under the Burial Acts, as harbour, pier, or dock, &c., authorities, and as port sanitary authorities. It is in this part of the statistics that we find information with regard to gas, water, and electric lighting works; and the financial transactions recorded in the accounts now to be considered are of much greater magnitude than those which appear in the borough fund accounts of the councils. It is, however, remarked in the report that, in estimating the effect of these transactions on the local taxation of the year, "it should be borne in mind that, though a considerable portion of the expenditure was defrayed out of the public rates for the purposes of public health and sanitary improvements, a large portion was to a greater or less extent reproductive, having been incurred in respect of undertakings which in some instances were wholly or partly self-supporting, and in others, besides paying their expenses, operated towards a reduction of the rates. The most important of these undertakings are water-works, gas-works, electric lighting, and harbours, piers, docks, &c."

The receipts of the councils other than from loans, which were shown in accounts other than borough fund accounts, excluding transfers from other accounts of the councils, amounted during 1905-6 to £28,005,344. Of this £11,389,483 was received from rates, &c. As to the reproductive undertakings with which "JOURNAL" readers are concerned, the receipts (excluding sums transferred from other accounts to meet deficiencies in revenue, and also transfers from other accounts of the councils) were: Gas-works, £6,191,875; water-works, £3,711,510; and electric light undertakings, £2,140,010. The expenditure (excluding that defrayed out of loans, and deducting amounts received from accounts of the same councils) was £27,919,204; and some of the items which went to make up this enormous sum are: Gas-works, £5,639,588; water-works, £3,910,454; electric lighting (including loan charges—which cannot be distinguished from other loan charges—but no other expenditure on account of public electric lighting), £1,936,284; sewerage and sewage disposal, £2,159,908; and public lighting (including expenditure on public electric lighting not represented by loan charges), £1,166,608. In the cases of gas, water, and electric lighting, the figures given are exclusive of sums transferred to other accounts in aid of rates. The charges that were met out of revenue on account of loans were as follows: Gas-works, £1,188,202; water-works, £2,550,497; and electric lighting, £1,294,772. In addition to the above, the following sums were paid as charges in respect of capital belonging to the councils which had been appropriated in lieu of borrowing: Water-works, £937; and electric lighting, £1117.

The expenditure defrayed in the year under review by councils on other than borough fund purposes which was charged, or intended to be charged, to loan account was £8,654,181, of which £404,457 was for gas-works, £2,006,119 for water-works, £1,480,693 for electric lighting (including expenditure on public electric lighting), and £1,247,338 for sewerage and sewage disposal works. The total amount of the loans raised during the year was £7,862,239; and of this £1,461,454 was for water-works, £1,548,633 for electric lighting (including public electric lighting), and £1,058,169 for sewerage and sewage disposal works. Gas-works are not mentioned in connection with the loans raised during the year. The sum applied to the repayment of principal and the redemption of stock or annuities during the year by the borough councils in respect of the debt on account of loans raised by, or transferred to, them for other than borough fund purposes, was £3,434,110; and the amount paid for interest and dividend was £5,978,731.

The loans of these councils for other than borough fund purposes which were outstanding at the end of the year 1905-6 (not being loans raised by councils and advanced to school boards, since dissolved) amounted to £182,606,485. Of this gigantic total, £19,639,606 was for gas-works, £59,027,300 for water-works, £20,043,548 for electric lighting (including public electric light works), and £19,966,605 for sewerage and sewage disposal works. Loans outstanding in respect of gas-works, water-works, markets, harbours, piers, docks, &c., and private improvement works, amounted to £110,803,765, without including any sums raised for these purposes which it was not found practicable to apportion between these and other works, and which therefore appear under the heading of "Other purposes." This represents a net increase of loan debt on the undertakings referred to of £3,185,169 for the year, including the debt of the new boroughs. The sums remaining in sinking funds, loan funds, and redemption funds at the end of the year 1905-6, to provide for the repayment of such portion of the outstanding loan debt as is repayable in this way, amounted to £11,328,442.

According to the 1901 Census (after taking into account alterations of area between that time and March 31, 1906), the total population of the 72 county boroughs was 9,622,799, and that of the 254 other boroughs was 4,295,684—making an aggregate of 13,918,483. The total rateable value of land and other property on April 1, 1905, was £72,116,717. Compared with the previous year, the increase in assessable value was a little over £2,000,000. The average borough rate of county boroughs was 2s. 9·1d. in the pound, and of other boroughs 1s. 6·1d.; while the average general district rate of the county boroughs was 3s. 1·8d. in the pound, and of the other boroughs 3s. 2·2d.

One of the tables in the report gives such particulars as were furnished in the returns received by the Local Government Board relative to (1) transfers made by borough councils from the accounts of their tramway, light railway, water, gas, electric lighting, harbour, &c., and certain other undertakings in aid of rates; and (2) transfers made by such councils from borough, district, or other funds to meet deficiencies in the revenues of undertakings of the same class. The transfers in aid of the rates were: From tramways and light railways, £189,999; water-works, £113,444; gas-works, £521,434; electric lighting works, £83,084; and other undertakings, £44,835. The transfers to make up deficiencies in revenue were: From tramways and light railways, £46,556; water-works, £171,113; gas-works, £2827; electric lighting undertakings, £29,887; and other undertakings, £7326. The total amount transferred by the boroughs in aid of the rates was £952,796; while the amounts transferred from the rates to make up deficiencies in revenue came to £257,709.

Of the gas-works profits thus transferred in aid of rates, the amounts over £10,000 were: Birmingham, £54,526; Blackpool, £15,107; Bolton, £20,000; Burnley, £14,263; Dewsbury, £12,107; Huddersfield, £32,617; Leeds, £17,535; Leicester, £38,467; Manchester, £59,283; Nottingham, £27,000; Rochdale, £17,693; Salford, £23,936; Southport, £14,500; Stockport, £14,099; Warrington, £10,408. With regard to the electric light undertakings, profits of £10,000 and over are not by any means so numerous—in fact, Liverpool (£19,740) and Salford (£10,000) are the only two instances to be found. In water-works, again, there is also, naturally, a lack of large profits to be discovered, though Bolton comes out with £11,922, and Leeds with £19,236.

Now as to the losses. The position here is exactly reversed, for gas-works, which were most largely represented on the profit side among the three undertakings that have been mentioned, are the most scarce when the question of losses is being considered. At Morecambe there was a loss of £1699, and at Chard of £1128; while Appleby transferred £141 from the district fund for part

repayment, &c., of loans, and at Wenlock £250 was similarly transferred. No less than twenty-nine electricity undertakings show a loss; but of these in only fourteen cases is the amount over £1000, and in only one over £2000. Numerous water-works once more show losses; but, generally speaking, the amounts are not very great. The sums over £10,000 are: Birmingham, £45,000; Halifax, £12,091; Huddersfield, £12,541; Cardiff, £10,759; and Swansea, £18,909.

In previous years, the accounts of the urban district councils have been included in the same Blue-Book; and therefore they have been available for notice at the same time as the borough council accounts. On this occasion, however, they are not so included.

AUTOGENOUS WELDING BY THE OXY-ACETYLENE FLAME.

At a recent Meeting of the Technology Club of Syracuse (N.Y.), M. Eugene Bournonville read a paper on the above subject, in which he traced the steps which have led to the perfection of the process dealt with.

The author began by explaining that autogenous welding is the uniting by fusion of metals of the same nature at high temperature, without the intervention of a different metal, as is done in soldering or brazing. This welding is accomplished by means of a blowpipe known as the "oxy-acetylene torch." The high temperature of the oxy-acetylene flame was discovered by M. Le Chatelier in 1895; and in a note to the French Academy of Sciencies, he presented his calculations, showing that, with an equal volume of oxygen, acetylene would give a temperature of about 4000° C. (7200° Fahr.), which is 1000° C. (1800° Fahr.) greater than the temperature of the oxy-hydrogen flame. The first experiments were greatly impeded by the "flash-back" caused by the rapid propagation of the flame; and it was not until 1901 that a practical torch was obtained. It was developed by MM. Fouché and Picard. Their success was due largely to the use of compressed acetylene; but even then they had to carburet the acetylene with gasoline. Still better results were obtained when the acetylene was mixed with ether to prevent the "flash-back."

Since the disclosure of M. Le Chatelier and the inventions of MM. Fouché and Picard, many attempts have been made to improve upon their designs. The greatest success appears to have been attained by the invention of MM. Camille Rodrigue-Ely and Emile Gauthier, of the firm of A. Boas Rodrigues et Cie., of Paris. There are now three distinct types of oxy-acetylene torches—the high pressure, the low pressure, and the medium pressure. The advantage of the high-pressure torch is that, both gases being under pressure, the operator has perfect control of the mixture for the flame, and is able to add to or reduce the volume of either gas as required to obtain a perfect flame. The low-pressure torch is used with the oxygen under pressure; while the acetylene is taken from an ordinary lighting generator in which the pressure is slight. As the proper mixture is 1 part of acetylene to 1·28 parts of oxygen, and the mixture by the injector is problematical, a perfect flame is difficult to obtain, and almost invariably there is too much oxygen and the weld is oxidized. The medium-pressure torch was devised to remedy, so far as is possible, the defects of the other two types. It is constructed very much on the style of the low-pressure torch, except that the mixing of the gases is accomplished entirely in the nozzle or tip. This arrangement enables the operator, by simply changing the tip of the torch, to alter the whole combination, and obtain the flame best adapted for the thickness of the metal to be welded, without changing the torch itself. For the reasons stated, this torch is the ideal tool for autogenous welding.

The following table, taken from the "Bulletin Technologique" will be found of much value in making comparisons of the various gases which can be used in autogenous welding:—

	Oxy-Acetylene Mixture.	Oxy-Hydric Mixture.	Oxy-Coal Gas Mixture.
Number of calories obtained by complete combustion of 1 cubic metre of gas	14,000	2,600	5,500
Quantity of pure oxygen theoretically required for the perfect combustion of 1 cubic metre of gas	3 2m. 510l.	3 620l.	3 923l.
Quantity of oxygen required for 1 cubic metre of gas to obtain the best welding flame (from a practical test made)	3 1m. 300l.	3 250l.	3 670l.
Quantity of gases required to obtain 1000 calories with a welding torch	3 A. 66.66l. Ox. 86.66l.	3 H. 384.60l. Ox. 096.15l.	3 G. 181.81l. Ox. 121.21l.

The demand note for the general district and poor rate of the County Borough of West Ham, shows that a charge of 1d. in the pound is made on the general district rate for the deficiency on the electricity undertaking.

THE "MASCOT" INVERTED BURNER.

Since Moffat's Limited have embodied with their business, as self-intensifying gas-lamp specialists, trading in general gas-lighting fittings, they have introduced several effective burners; and these, with a large range of ornate fittings and glassware, or plainer styles for practical business requirements, are to be seen, and when seen admired, at the show-rooms at 13, Farringdon Road, E.C. We cannot dwell on the various types, but must simply take the latest burner for interior use that the firm have just brought out as a good representative of the taste displayed in design and of efficiency for the destined purposes. This burner will be known as the "Mascot." Externally, while the head of the burner is of tasteful character, there has been an eye to the design being of practical utility. An examination of the accompanying illustration will show that in the burner there is no provision for air-regulation; but there is for gas adjustment a needle regulator. Tests made with the lamp show that the regulation of the gas supply to the air supply gives as good an efficiency as can be obtained by complicating matters by giving consumers the second (or air) adjustment to attend to. It is the gas, being the portion of the mixture that may vary, and does vary in different localities, in quality, that requires regulation; and the increased or reduced current of gas increases or reduces as required the draft upon the primary air supply. The air supply is furnished through the slots in the side of the gracefully curved hood; and these aid in giving ornamental effect to the head. Outlets are provided at the top for the escape of the surplus air. Passing into the hood and up to the air-inlets of the bunsen tube, the air gets slightly heated by the absorption of heat from the metal parts of the burner. Between the burner hood and the band supporting the globe, there is a cone which serves the double purpose of completely isolating the air chamber in the hood (so keeping the air supply to the burner free from vitiation by the products of combustion) and giving, being white enamelled, a reflecting surface for the light. The outward curve of the hood at the base, with the band globe support below, provide openings for the exit of the products of combustion in such a manner that both ceiling and fittings are fully protected. The casings are constructed of stamped brass; and they have an attractively clean finish about them. The burner nozzle and mantle support are in one piece, being made either of brass or a magnesium material. Fitted with round or cylindrical decorated globes, the burner has a very striking appearance. The claim as to illuminating power is 90 candles per 3½ cubic feet consumption of 16-candle gas, tested by the "Metropolitan" No. 2 burner, which represents an efficiency of 28 candles per cubic foot of gas.

Resisting Power of Well-Made Concrete.—Referring to the recent gas explosion in Bermondsey, and to the evidence given by Sir Alexander Binnie at the first inquest, to the effect that the large cavity discovered in the road must have been in existence for a considerable time, as he found two high-water marks upon its sides, the "Builder" last week said: "The most extraordinary circumstance in connection with the affair is that the part of the Grange Road over the cavity consisted of nothing but a thin layer of concrete covered by granite setts. This apparently frail support had borne the weight of ordinary traffic and horse-drawn tramcars without the least indication of failure, until fractured by the explosion; thus affording a most striking illustration of the valuable properties possessed by well-made and thoroughly-seasoned concrete."

Humic Matter in Coal.—This was the subject of a recent communication by M. Boudouard to the Paris Academy of Sciences; and the following abstract of it is given in the "Chemical News." The oxidation of coal in air gives rise to brown products of an acid character, soluble in alkalis, and resembling humic compounds; and there seems to be a certain relation between the coking power of the coal and the proportion of these substances present. The author treated coals of various origins with potash, in order to extract the humic matter, which he subjected to an elementary analysis. In the original paper the results are given of fourteen analyses in which the carbon varies from 52 to 67 per cent., the hydrogen from 3 to 5 per cent., and the oxygen from 30 to 44 per cent. When results of the analyses are examined, they fall into four groups; the formulæ of the humic matter being $C_{18}H_{14}O_6$, $C_{18}H_{18}O_9$, $C_{18}H_{14}O_9$, and $C_{18}H_{14}O_{11}$ respectively.

ELECTROLYSIS OF NEW JERSEY WATER-MAINS.

According to an article in a recent number of "Engineering Record," there has for some years been trouble in Newark (N.J.) on account of the damage that was caused to the water-mains by electrolysis.

The subject first received attention in the year 1895, when an attempt was made to remove the currents by connecting the water-pipes at different points with the electric railway return cables. Further damage was discovered in 1902 and again last year, on both of which occasions investigations were made. Since then the electrical conditions have changed greatly, and the amount of damage was thought to have increased to such a degree that extensive inquiry was undertaken by Mr. W. E. Foss, of Boston, for the Department of Public Works. It lasted, with some interruptions, for about three months. As the result of his report to Mr. Morris R. Sherrard, the Chief Engineer of the Department, negotiations are now in progress with the Public Service Corporation of New Jersey, which controls the street railway and electric light systems, to get the latter to consent to bear the expense of the investigation and pay for renewals of the mains destroyed. It is proposed that this agreement should remain in force only until such time as a final decision is given on cases now pending before the Courts. In his report, Mr. Foss goes into the subject in great detail; but only the most important parts are abstracted by our contemporary, and these furnish the following particulars.

There are in Newark about 350 miles of water-mains, varying from 4 to 60 inches diameter, and all of them, except a few miles of large steel mains, are of cast iron. The gas-mains are also of this material. About 80 miles of conduit, carrying some 300 miles of lead sheathed electric cables, are laid in certain streets, particularly in the business district. The street-car system has about 100 miles of single track, over which 250 to 350 cars are operated every day. The rails for these tracks weigh generally from 85 lbs. to 109 lbs. per yard, though there are a few miles laid with 56-lb. to 66-lb. rails.

The street railway, electric light, and gas systems belong to the Public Service Corporation of New Jersey. The main power station was put in operation on Feb. 14, 1895, and sub-stations were open on Jan. 1, 1904, and March 1, 1905. Negative return cables of bare copper wire extend 1¼ miles north of the power-house and about 1 mile west. The difference in potential between the rails and these negative cables has been measured at several points, and in no case has it been higher than 0·1 volt—showing low resistance in the connections between the rails and the cables. The rails are bonded with cast weld bonds and various types of copper wire bonds.

The current used by the street railway is direct, at 550 volts. During peaks, the consumption runs as high as 20,000 ampères, though the average during the day is from 10,000 to 12,000 ampères. The current sold for power is direct current transmitted at 500 volts from the power-house. The lighting current is transmitted as alternating current at 2300 volts, and stepped down at the point of consumption to 110 volts. No damage, Mr. Foss states, results from the electric light and power circuits, since they are insulated from the ground, except where it was found in the investigation that the secondary circuits had been grounded to the water-mains in a number of places. These grounds were sometimes placed on the house side of the meters. The lead sheathing of the power and light cables, as well as those of the New York and New Jersey Telephone Company, have been drained electrically to the electric railway return system at various points, and in such a way as to contribute to the damage of water-pipes by the escape of current to the pipe where these connections are made. At the time the investigation was undertaken, there were six connections for draining the current from the water-pipes to the railway returns.

The inquiry involved 299 measurements of the difference of potential between the water-pipes, rails, cable sheathing, and ground, 143 measurements of the intensity and direction of current on the water-pipe itself, the examination of water-pipes in 69 places, where the pipe was uncovered generally for a length of 10 feet, and the establishing of 31 permanent gauging-stations for convenience in making future investigations. These permanent stations have connections made with the water-pipe at two points equidistant on either side of the station, and leads are brought to a gate-box at the street surface. A conductivity constant for each station has been determined, so that when it is desired at any time to find the amount of current flowing on the water-pipe, a reading need merely be taken in milli-volts. This reading multiplied by the conductivity constant for that station will give the current flowing on the pipe. The readings of difference of potential showed clearly by their variations that they were caused by the street railway currents, having the well-known fluctuations and characteristics. The water-mains, despite the fact that they are connected to the railway return near the power-houses, are permanently positive to the rails and to the ground in these districts, except in the immediate vicinity of the connections. The maximum positive difference in potential varies from 4 to 5 volts. In many of the outlying districts the water-mains are negative to the ground and rails; the maximum difference in potential being from 10 to 16 volts. The variation in the differences of potential as the distance from the power-stations increases is fairly uniform and gradual. The water-mains are, in general, positive to the cable sheathing; the difference in their potential varying from 1 to 8·5 volts.

The amount of current passing between the water-mains and the street railway returns was also investigated. In seven connections the current flowed from the pipe to the rail, and in four of them ran above 50 ampères under the average load on the street railway system. One of these connections showed from 120 to 220 ampères; the total of the seven varying from 315 to 645 ampères. Other connections showed a flow in the other direction—that is, from the street railway returns to the water-pipe—amounting together to from 310 to 640 ampères. These values are also under the average load, and run from 60 to 80 per cent. higher at the peaks.

The examination of the water-mains was made with the aid of a testing-hammer, in order that the crust might be broken through and the soft material exposed. Plaster casts were taken at 26 points where the pitting was deepest. This was found to be the case where the pipes were then, or had formerly been, positive to the ground; and, as a rule, the corrosion was most rapid when the ground was damp or wet and contained clay. The most rapid corrosion was found in 6-inch pipes laid in wet clay, where 50 per cent. of the thickness of the pipe had been eaten away and nails could be driven into the iron. In 51 places the corrosion varied from 2 or 3 per cent. to as high as 100 per cent. The pipe which was entirely eaten through had been in service in two cases for 21 and 25 years respectively, and in a third case for only five years. At two points where large cast-iron and steel pipes cross the street railway tracks the pitting was particularly noticeable; a 36-inch cast-iron pipe in one case being pitted 10 per cent. of its thickness, and a steel main of the same diameter to the extent of 25 per cent. At one of these crossings, the damage had been done within a period of four years. The investigations also disclosed the fact that some pipe which had been in the ground for 35 years, and had not been exposed to electrolysis, was apparently in as good condition as when it was laid.

As a result of the investigations, Mr. Foss has concluded that the light, dry sand which extends under a large portion of the city is very unfavourable for electrolysis, even though the water-mains have been damaged, and the action is still continuing in many places. If not damaged by electrolysis, the mains would not be destroyed by natural corrosion, and would last till outgrown and abandoned for other reasons. He recommends that the City should require the Public Service Corporation to remove the electric railway currents within a reasonable time. Insulated joints should be used wherever there is a chance of considerable leakage occurring from the street railway tracks to the water-mains, as in the streets in front of car-houses. For this purpose the adoption of the wood insulation joint used in the water-works system at Boston is advised.

The installation of pilot wires from the power-stations to the ends of all the car lines is recommended, so as to afford a means of measuring easily the flow from the water-pipes to the rails or from the rails to the pipes. With this information easily obtainable, the causes for leakage might readily be determined and removed, and defective rail-bonds would be more easily detected, with the result that the damage to the water-mains in the vicinity of the power-stations would be decreased. When the water-mains and the railway return are connected, they form part of the circuit, and the service pipes and fittings are connected with the negative side of the dynamo, and in consequence trouble may ensue from short-circuits and lightning. Mr. Foss therefore recommends that connections should not be allowed between the electric railway return and the water-mains, except as a temporary expedient to reduce the rate of corrosion at certain points. On account of the thinness of steel water-mains as compared with cast-iron pipes, Mr. Foss believes that, though they are more desirable and economical under certain conditions, their use, even in rural districts, will be accompanied with considerable risk, so long as the street railway systems are permitted to operate with uninsulated circuits.

Eighty Cent Gas for New York.

It will probably be in the recollection of most of our readers that in the early part of 1906 a Bill was passed by the New York State Legislature, as the outcome of a long inquiry, reducing the price of gas in the city from $1 to 80 c. per 1000 cubic feet. The Consolidated Gas Company resisted the enactment as being unjust and inequitable; and they obtained from the Federal Judge an injunction against the enforcement of the new law, and an order allowing them to charge at the old rate pending an appeal to the Supreme Court. While this was in progress, they had to pay into Court the difference of 20 c. per 1000 cubic feet; and it has now reached a total of about $9,000,000 (£1,800,000). The Court has just given its decision; and it is against the Company. They will, however, have leave to appeal if, after trial, they find the lower rate does not allow of the payment of fair dividends. The announcement, which was made at noon on Monday last week, completely upset the New York Stock Market; the rush of selling amounting almost to a panic. In a very short time the Company's stock fell 27 points; and the whole market was demoralized. There was a further fall on Tuesday; and heavy selling caused all prices to give way rapidly—a fact which, the "Financial News" remarks, does not say much for the stability of the Wall Street market.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Windsor Street Gas-Works.

On Saturday afternoon, about forty members of the Association, by permission of the Gas Committee, paid a visit to the Windsor Street works of the Birmingham Corporation, where an exceedingly busy afternoon was spent, for the works occupy an area of about 26 acres. The visitors were conducted round in three parties—the first under the guidance of Mr. John Foster, the Engineer-in-Charge; the second, under Mr. E. B. Tomlinson, the Works Engineer, and Mr. C. C. Barber; and the third, under Mr. A. N. Comely. It may be mentioned that a full description of these works, with numerous illustrations, appeared in the "JOURNAL" in 1902, in connection with the retirement of Mr. Charles Hunt from service with the Corporation. The articles will be found in the numbers for Aug. 26 (p. 548), Sept. 2 (p. 616), and Sept. 9 (p. 676) of that year.

In the old portion of the works there are two direct-fired retort-houses which are still retained for use during the winter months; but attention was naturally devoted to the huge house on the new side, which has a length of 487 ft. 6 in. and a total width of 210 ft., and occupies an area of about 2¼ acres. This is approached by three lines of overhead rails (the works have a siding from the London and North-Western Railway), enabling coal to be dropped from the waggons on to the charging stage, which is 10 feet above the yard level. A notable feature in connection with this house is an arm of the Birmingham Canal, which extends within it to nearly the full length of the house, and is intermediate between the retort-benches; while parallel with the canal for about one-half the distance is a railway dock. Thus the unscreened coke can be sent away either by rail or water. There are three works' locomotives, though, of course, they are not all working at one time. The coke that is to be screened is quenched and run into trucks, holding about 10 cwt. each, which are drawn out of the retort-house on rails, two at a time, by ponies. It is then elevated to the screens, which sort it into various sizes. The retort-house contains 1512 mouthpieces; the retorts being throughs, 22 in. by 16 in., 22 ft. 3 in. long, set in beds of nine. Each of the two retort-benches is divided into three sections; and each section comprises fourteen beds of retorts. The method of heating employed is regenerative; the system being Hunt's modification of Klönne's. Six-hour charges of 6 cwt. are worked; and the make at present is just over 11,000 cubic feet per ton of coal. Many of the retorts are both drawn and charged by Arrol-Foulis hydraulic machines; but in one portion of the house Ross steam drawing machines are to be seen in use.

From the new retort-house, the gas is conveyed by two 30-inch steel and one 30-inch cast-iron mains, suspended from the railway viaduct, to three sets of atmospheric condensers, consisting of a series of cast-iron flanged pipes placed vertically and controlled by valves so that each set can be worked wholly or in part. There is also a set of water-cooled condensers. Above the condensers is a tar-tank, as well as a water-tank supplied from a deep-well pump. Three Livesey washers at the outlet of the condensers are supplied by gravitation with the weak ammoniacal liquor formed in the condensers. The exhausters are of the Beale rotary type.

The power required is supplied by four Lancashire boilers 8 ft. 6 in. diameter, by 33 feet long, fitted with Meldrum's forced draught furnaces. Two triple-expansion horizontal Worthington duplex hydraulic pressure pumps are each capable of delivering 340 gallons per minute at a pressure of 700 lbs. per square inch. On the old side of the works there is a Mann and Walker tower-scrubber, filled with coke; and on the new side, two Kirkham, Hulett, and Chandler scrubber-washers, each of a nominal capacity of 5 million cubic feet per day. The cyanogen plant includes two Holmes rotary washers, each of a nominal capacity of 2½ million cubic feet a day. The efficiency secured is 60 or 70 per cent.; and the make, something like 3 tons a week.

The coal gas purifiers consist of two sets of six, 44 ft. by 32 ft. by 6 ft. deep, which have recently been converted from two sets of four, 66 ft. by 32 ft.; and one set of six, 40 ft. by 32 ft. by 6 ft. deep. There are three 150,000 cubic feet per hour station meters; and a carburetting apparatus equal to 1 million cubic feet of coal gas per hour, enriched to the extent of 1 sperm candle. The enriching material employed is a light oil, having a specific gravity of about ·680, for which there is a storage tank capable of containing about 25,000 gallons.

There are, of course, on the works a laboratory and photometrical and other appliances for general testing purposes; and close by there is an experimental works comprising three cast-iron retorts in separate settings, each to carbonize ½ cwt. charges. In connection with this are condensing and purifying plant and three gasholders of 20, 350, and 970 cubic feet capacity. Outside the building, too, there is another small retort for testing oils. Along the wall are to be seen two rows of small bins, the upper ones containing samples of coal, and those underneath pieces of coke from the coal in the bin directly overhead. These samples are taken when testing the first deliveries of particular coals, and kept for reference, when testing samples of subsequent deliveries.

The eight holders have a total storage capacity of 16,752,000 cubic feet. The two largest are three lift, and have each a capacity of 6,250,000 cubic feet. The diameter of the outer lift is 236 feet; and the extreme height when filled is about 165 feet. During the recent frosty weather, the cup of one of these large holders was leaking, so that a supply of water to it had to be kept running; and when the water in the cup began to freeze, there was an overflow, which ultimately resulted in the lift becoming wedged with ice. This difficulty was, however, soon overcome; the ice being thawed with steam-jets and chipped away.

The carburetted water-gas plant, which consists of four 1 million cubic feet per day sets, is by the Economical Gas Apparatus Construction Company. Each set is fitted with Cutler's patent interlocking gear. In connection with the plant are three oil-storage tanks, each of a capacity of 440,000 gallons; a single-lift Pease's patent rope-guided relief holder, 78 feet diameter and 20 feet deep; and two 100,000 cubic feet per hour meters. The purifiers consist of one set of four (on stage), water lute, 40 feet by 30 ft. by 6 ft. deep; one set of two, luteless, 40 ft. by 30 ft. by 6 ft. 2 in. deep; and one set of four, water lute, 52 ft. by 24 ft. by 6 ft. deep. Coke is conveyed to the water-gas plant from the retort-house by means of a 24-inch gauge railway and tipping trucks.

There is on the works a large meter repairing shop, where twenty tinmen are employed. Some 8500 consumers' meters pass through the shop yearly; and they are all tested there before being sent to the City Meter Testing Office to be certified. There is also a cooker and stove repairing shop.

The productive capacity of the works is about 10,500,000 cubic feet of coal gas, and 4,000,000 feet of carburetted water gas per day; but this output is capable of being largely increased by the complete utilization of the site.

At the conclusion of the visit, the members proceeded to the Hen and Chickens Hotel, where they had been invited by the Birmingham Corporation Gas Committee, to partake of tea. Some time was spent in this pleasant occupation; and then

Mr. FOSTER said the Gas Committee, the Secretary (Mr. G. Hampton Barber), and himself had been pleased that the members should visit the Windsor Street works; and they were anxious that the inspection should be an instructive as well as a pleasant one. Gas had a very great rival to fight against in electricity, which, he thought, was growing more rapidly now than in the past. As a rule, a gas department were very heavily drawn upon for contributions in relief of the rates; but he thought if the statistics were gone into it would be found that electrical departments paid less in this respect—which was, of course, a handicap to the gas undertaking. To his mind, the fair thing would be to ask the electrical department to pay over to the rates a proportionate amount on their capital to that which was taken from the gas department. When, however, they came to consider that electricity had been produced under some circumstances at less than ¼d. per unit, and had been sold at a profit at ½d. per unit, they would understand that there was a great rival in front of them, and that it behoved them all to work hard in going into the details of the manufacture of gas. A lot of headway had been made during the past few years in the direction of cheapening gas production. Carbonizing had been the subject of a great deal of improvement. It seemed to him that, so far as the carbonizing of coal in vertical retorts was concerned, they would reach finality, unless some different method altogether of distilling coal could be brought forward. It had been suggested that the coal might be reduced to gas under heavy pressures; but he could not see that, even if they did this, they would lessen the number of their operations. At any rate, he did not see that it could reduce the first plant—that was, the retort-house plant. They got the coal in its bulky condition; and they would have to deal with it in that condition. Condensation had been treated in various ways; and he thought that the Feld process was the only thing that had any chance of reducing costs there. With regard to purification, they had, to his mind, a lot still to learn. They had not reached finality there; and it was in the matter of purification that they ought to look further afield. Some works were purifying with a profit on revenue—but, of course, not on capital expenditure. If the capital outlay was considered, he thought it would be found that the purifying costs came out pretty heavy. Then in reference to distribution, there was a great deal to be done. The question of meters was one which they would have to go into. They should try to get an efficient meter at a much less cost, though he did not know how it could be done. They were testing meters with which they hoped, with an ordinary 5-light size, to get up to 100 cubic feet per hour. They had already tested several; and they came out pretty accurate until they got up to 100 feet, when they were apt to be rather erratic. Of course, it was possible that they would come generally to high-pressure distribution; but in this connection the difficulty was now, and he thought would be, the question of governors. This would constitute the chief obstacle to be overcome. However, with a proper system of vertical retorts, coal and coke conveying appliances, and plant for dealing with the coke subsequently—not selling it as in the old days in any condition that was convenient to themselves, but making a material that was suitable for the consumers who used it—very much could be accomplished. He might say that in Birmingham they were now supplying the coke to people in the condition that they wanted it; and it was paying very well indeed to do so, as they were getting a higher value for it. He had already referred to purification,

which was a direction in which very little had been gained for many years past. He was of the same opinion that Professor Foster was—that they had the material for this on their own works. The Hills process of purifying by means of ammonia had not been a success; but he thought there was something in the idea, if they could only get the right kind of plant. If experiments in this direction could be brought to a successful issue, they would all see what an effect it might have on the capital cost of works. Then, again, purification at present was the most dangerous part of the process of gas manufacture. There was more danger in purifying with open boxes than in any other part of the plant; and if they could do it in closed vessels, it would be one of the greatest means by which they could hope to reduce the price of gas. In conclusion, he remarked that he was sure the Gas Committee and the Secretary would be delighted to hear that the members had had an enjoyable and an instructive visit to their Windsor Street works.

The PRESIDENT (Mr. James Hewett), in proposing a hearty vote of thanks to Mr. Foster for the cordial welcome extended to them that afternoon, and also to his assistants for the trouble they had taken, said he had had the pleasure of going round with Mr. Foster's party, and could vouch for the care with which he had described everything to the visitors. Doubtless the assistants were doing likewise with the other parties. Of course, as Mr. Foster was an honorary member, there was no necessity to give him any particulars with regard to the Association. He was, however, sure that all those who had joined in the visit had gained something by the inspection that afternoon. They would always remember the occasion; and, on behalf of the members, he asked Mr. Foster to convey their thanks to the Chairman and members of the Gas Committee and the Secretary for kindly granting them permission to go over the works, and for the hospitality that had been extended to them. It showed that the efforts the members were making to improve their positions were appreciated.

Mr. A. O. JONES, of West Bromwich, seconded the vote of thanks, and remarked that they were all greatly indebted to Mr. Foster and his assistants for giving up, as they had done, a Saturday afternoon to the inspection. They had done everything they could to interest the members and to supply information which had made the visit both enjoyable and instructive.

The proposition was carried with acclamation; and

Mr. FOSTER, in acknowledging the vote, said he wished to thank them for having made him an honorary member of the Association. This was the first occasion on which he had had an opportunity of doing so; but he hoped in future to be able to attend some of the meetings. It would be a pleasure to do so, for he felt how necessary it was for each one of them to further in every possible way the interests of the gas profession.

The "Water Arbitration Prize" Paper.—At the meeting of the Institution of Mechanical Engineers next Friday, the paper which gained the above-named prize—viz., "The Filtration and Purification of Water for Public Supply," by Mr. John Don, of Maybole—will be read and discussed.

Illuminating Engineering in the United States.—We learn that the Phœnix Glass Company, New York, Pittsburg, and Chicago, have retained the Bureau of Illuminating Engineering, of No. 437, Fifth Avenue, New York, to act as consulting and designing illuminating engineers, in the matter of designing and re-designing glass globes and reflectors as manufactured by them for any illuminant, and under all conditions. They are the first company of their kind to recognize the value of illuminating engineering to the extent of engaging independent authorities to undertake such work as is here indicated; and their reasons for the step are, first, to obtain, in proper proportion, beauty and utility, and, secondly, to secure the development of new characters of glass, and its application from the physiological, as well as the æsthetic, point of view. In carrying out the idea, the effect of light on the eye will receive careful consideration. Mr. Albert J. Marshall, the Chief Engineer of the Bureau, will have direct supervision of the work.

Production of Gas from Tar.—The specification has lately been published of a patent taken out in France by Heeren Rincker and Wolter for their process and apparatus for the production of gas from tar. The special feature of the invention is that the gas is produced in two generators operating alternately; so that the tar, which is treated in the first by being made to pass through glowing fuel, whereby it is converted into gas, escapes by its own expansion, and the tarry vapours remaining behind are carried forward into the second generator by means of a current of air which enters at the bottom of the first. There they pass through glowing fuel, which converts them into gas. The operations are then reversed. The apparatus is similar in character to that described and illustrated in the "JOURNAL" for Dec. 13, 1904, in connection with Heeren Rincker and Wolter's English patent for making gas from oil. The patentees claim that by the method described their apparatus is employed in the best possible manner, not only for the production of gas, but also for its carburation and fixation. The gas on leaving the generator burns, without any further treatment, with a clear and luminous flame; and it possesses in addition high calorific power. As was mentioned in the "JOURNAL" for the 24th of November last, a Syndicate has been formed in Amsterdam to work the process.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to the Bradford Road Gas-Works.

About seventy members of the Association answered the invitation extended for a visit and inspection on Saturday of the Bradford Road Station of the Manchester Corporation Gas Department. Those present included Mr. T. Duxbury, of Oldham, the President of the Senior Association.

On arrival at the works in the early part of the afternoon, the party were received by Mr. J. G. Newbigging, M.Inst.C.E., the Chief Engineer, and, divided into four sections, at once proceeded on their tour of inspection under the guidance of Mr. Newbigging, Mr. J. R. Hill, the Manager of the Bradford Road Works, and Mr. W. H. Cummins, the Chief Draughtsman, assisted by Messrs. A. L. Holton, C. Woodhead, and W. Buckley, members of the Junior Association. It was not a good day for the visit—a heavy fog enveloping the numerous buildings that go to make up the most important works of the Manchester Gas Department.

The Bradford Road works is the largest manufacturing station belonging to the Corporation. The area of the site is 52 acres 3856 square yards; the land having been acquired in 1870. The foundation stone of the works was laid on Oct. 10, 1877, by Alderman Hopkinson; and gas was first made on Dec. 16, 1884. The future extension of manufacturing plant will be carried out at this station; and when the land is fully occupied, the total capacity of the works will be from 25 to 30 million cubic feet per diem. The total expenditure on land, buildings, and plant at March 31, 1908, was as follows:—

Coal-Gas Plant.		Carburetted Water-Gas Plant.		Chemical Works.
Total Expenditure.	Per Million Cubic Feet Made.	Total Expenditure.	Per Million Cubic Feet Made.	Total Expenditure.
£640,693	£293	£153,025	£132	£38,631

The capacity of the works per 24 hours is: Coal gas, 8,000,000 cubic feet; carburetted water gas 6,500,000 cubic feet—total capacity, 14,500,000 cubic feet. During the year ended March 31, 1908, the quantity of gas manufactured at the works was: Coal gas, 2,186,266,000 cubic feet; carburetted water gas, 1,164,117,000 cubic feet—total, 3,350,383,000 cubic feet. The illuminating power of the mixed gases distributed was 17·71 candles, as tested with the "Metropolitan" argand No. 2 burner. The yield of gas per ton of coal carbonized was 11,100 cubic feet; and the coke sold per ton of coal carbonized was 10·22 cwt. The total working expenses for the year ended March 31 last per 1000 cubic feet of gas made were 4·02d., which included carbonizing and generating wages, retort repairs, purification, maintenance of plant, salaries, and coke and water used to make carburetted water gas.

COAL GAS.

The carbonizing plant consists of two stage-floor retort-houses each 360 ft. long by 70 ft. wide, and containing 28 beds of horizontal retorts, 20 feet long, nine in each bed, Ω-shaped, and measuring 24 in. by 16 in. in section. The retorts are drawn and charged every six hours; the weight of the charge being from 8 to 8¼ cwt., and the make of gas 18,872 cubic feet per through retort per diem. West's compressed air drawing and charging machinery is employed in these retort-houses; and the rapidity with which the work is performed may be judged by the fact that 84 retorts are drawn and charged within an hour.

The coke is discharged from the retorts through the stage-floor into steel waggons, which are drawn from the retort-houses by horses to the coke-yard. The coke is stored by means of Woodward's coke-storage apparatus. This plant consists of a 30 cwt. steam-crane mounted upon the end of a long triangular-shaped platform, composed of wrought-iron girders, meeting in a centre boss at their inner ends, which rests upon and encircles the top of a cast-iron column bolted to a brick pillar. At its outer or crane end, the platform spreads out to about 14 feet wide, and rests upon two cast-iron rollers worked by power from the crane-engine, and is thus caused to rotate around the centre brick column upon a circular roadway built up of steel girders on cast-iron columns, 110 feet in diameter, and raised 20 feet high from the ground. This plant is capable of dealing with 200 tons of coke in 24 hours, hoisting a ton each lift, and conveying, tipping, and piling the coke 40 feet high in the form of a conical ring, of about 200 feet diameter at the base, containing about 7000 tons. The only labour required is one man at the crane and another one attaching and detaching the skips to the crane-chain.

The condensing plant consists of three Morris and Cutler water-tube condensers, and one Clapham "Eclipse" condenser, with vertical columns. The exhausters are two sets of twin rotary exhausters and engines combined, by Messrs. Gwynne and Co., each set capable of passing 280,000 cubic feet an hour; and two sets of twin exhausters and engines by Messrs. Laidlaw and Son, each set of 240,000 cubic feet per hour capacity. The scrubbing and washing plant consists of four Livesey washers, each of a capacity of 2,500,000 cubic feet per diem; two Kirkham, Hulett, and Chandler rotary "Standard" washer-scrubbers of 2,500,000 cubic feet capacity; and one of Laycock and Clapham's washer-scrubber of a capacity of 3,000,000 cubic feet per diem.

The purifiers for coal gas are situated in a purifying shed 410 feet long, and containing 22 purifiers. A wing has been built

with eight additional purifiers. The total area of the purifiers is 27,000 square feet. Artificial oxide of iron is used for the purification of the coal gas; and on purification account for the year ended March 31, 1908, a profit of £721 was made from sulphur and cyanogen recovered in the spent oxide.

There are five station-meters, each of a capacity of 176,000 cubic feet per hour. Three of the meters are used for registering the coal-gas manufactured, and two for carburetted water gas; the two gases mixing at the inlets to the holders.

The gasholders are five in number, of a total capacity of 13,800,000 cubic feet. Four are 144 feet in diameter, with three lifts, rising to a height of 90 feet when fully inflated, and one 250 feet in diameter, with three lifts, rising to a height of 164 feet. A sixth holder of four lifts is in course of construction, 285 feet in diameter, and rising to a height of 182 feet. The total capacity of this holder will be 10,410,000 cubic feet.

The following particulars of the new tank and gasholder are of interest:—

Tank—

Size of tank, 285 feet in diameter and 43 feet deep.
Excavation for tank walls, &c., 107,000 cubic yards.
Clay puddle, 7940 cubic yards.
Cement concrete, 5660 cubic yards.
Number of bricks required for tank, 4,000,000.
Thickness of tank wall, 5 ft. 6 in. at base, and 2 ft. 9 in. at top.
Stonework, 10,225 cubic feet.
Timber used in excavation to keep the ground intact until the walls are built:—
  Polling boards, 89,500 super ft., 1½ in. thick.
  Walling timbers, 14,660 cubic feet.
  Struts, 18,330 cubic feet.
  Punchings, 3000 cubic feet.
Total depth of excavation in trench, 50 feet.
Total depth of excavation in pipe recess, 56 ft. 9 in.
Total weight of steel and ironwork in tank framing, 258 tons.
Water required to fill tank, 9,042,018 gallons, or 40,366 tons.
Cost of clearing site, £3125.
Estimated cost of tank, £30,990.

Gasholder (Four-Lift)—

Outer lift, 282 feet diameter by 42 ft. 6 in. deep.
Third " 279 " " 42 ft. 6 in. "
Second " 276 " " 42 ft. 6 in. "
Inner " 273 " " 43 ft. deep.
Total capacity of holder, 10,410,000 cubic feet.
Ground level to top of holder crown, 182 feet when filled.
" " " guide-framing standards, 169 ft. 6 in.
The steel standards and guides are 32 in number, each weighing 30 tons complete.
Floating weight of holder, 1607 tons.
Total weight of steel and ironwork in holder complete, 3080 tons; excluding tank framing previously given.
Estimated cost of holder, with tank framing, and inlet and outlet pipes, £52,600.

In order to facilitate the distribution of the gas made at this station through the district of supply, the works are connected with the Gaythorn Station by a 36-inch independent main, and with the Rochdale Road Station with a 30-inch main.

Experimental Gas-Works.

At this station an experimental gas-works has been erected, complete from retort to governor. The capacity of the plant is 60,000 cubic feet per day; and it is so arranged that it can be increased to 100,000 cubic feet per day at little additional cost. The plant is used for the testing of coal, and general research work.

Carburetted Water-Gas Plant.

This consists of eight sets of Humphreys and Glasgow's producing apparatus, of a total capacity of 6,500,000 cubic feet per diem. The plant also comprises six Lancashire boilers, four blowing engines and fans, four exhausters by Messrs. R. & J. Dempster and Messrs. George Waller and Son, together with the necessary pumps, oil-meter, separating and settling tanks, &c. A relief gasholder, 80 feet diameter, and two oil-storage tanks, the latter of a capacity of 600,000 gallons, are situated at a short distance from the building.

The purifying-house for dealing with the carburetted water gas is constructed of steel, covering an area of 4444 square yards and containing twelve purifiers, each 35 feet square, with space for an additional four purifiers. The total area of the twelve purifiers is 14,700 square feet. The stage-floor carrying the purifiers has been constructed at a sufficient height to admit of the railway waggons running under them to receive the spent lime for removal by rail.

There is an oil-storage depôt at Mode Wheel, on the Manchester Ship Canal, belonging to the Gas Committee, where the vessels bringing the oil discharge their cargoes into the tanks of a capacity of 987,000 gallons. The oil is removed from this station to the Bradford Road works by motor tank-waggons.

Chemical Works.

A works for the manufacture of sulphuric acid and sulphate of ammonia is situated adjacent to the gasholders. The sulphate of ammonia plant is in duplicate; each section of a capacity of 20 tons per day. The sulphuric acid plant is of a capacity of 80 tons per week. The sulphuric acid is made from spent oxide and from the sulphuretted hydrogen from the sulphate plant; the latter accounting for one-seventh of the total production of acid.

The works deal with the whole of the ammoniacal liquor produced in the several works of the department; that from the Rochdale Road station being pumped through a 6-inch main, and that from the Gaythorn and Droylsden works being conveyed by boat on the canal. The total cost of manufacturing a ton of sulphate of ammonia at these works is £2 10s., including capital charges.

When an inspection was made of the site for the new gasholder, the interesting fact was mentioned that the Corporation were making their own bricks from the clay on the spot. Such bricks as are not required out of the make of 25 millions for purposes of the extensions now being carried out, are to be sold. At the time of the visit to the site of the new holder, 6 feet of earth had been taken off in the excavation work. On reaching the coal-gas exhauster-house, Mr. Newbigging drew attention to the tablet built in the wall recording the fact that "these works were opened under the direction of the Gas Committee in 1884." Alderman Gibson, the present Chairman of the Gas Committee, was then a member of that body.

After the inspection had been concluded, the members had tea together at the offices, on the invitation of Mr. Newbigging.

The Late Sir George Livesey.

Mr. E. J. Wellens presided over a short meeting that followed; and in moving that they, as an Association, place on record in the minutes their regret at the death of Sir George Livesey, and the loss the gas industry had sustained, he pointed out that they had not had the opportunity before of doing so, as this was their first meeting since the sad event. They ought to recognize, in the way he suggested, the work done by such an eminent man as Sir George Livesey.

Mr. D. V. Hollingworth seconded, and said that, in common with the rest of the members, he thought they ought not to let the occasion pass without placing on record their appreciation of the work done for the gas industry as a whole by that noble landmark, Sir George Livesey. The loss to the family by his death was undoubtedly great; but it was also great to that larger family of those connected with the gas profession.

The resolution was put and carried.

Thanks to the Chief Engineer and Staff.

Mr. F. Thorp moved that a vote of thanks be tendered to their host of the day—Mr. Newbigging—and of his staff. In mapping out the programme for the year, the Council of the Association aimed at something novel; and among other things it was decided that only one works be inspected during the session. In the selection of the works to be visited, they had chosen one which combined in it all the branches of the industry; and they were greatly indebted to the Chief Engineer for personally conducting them over the works. The action of the Council in selecting the Bradford Road station had been fully justified by the very large number of members.

Mr. W. L. Heald seconded, and in the course of his remarks said that, to judge by the time spent inspecting the carburetted water-gas and the sulphate of ammonia plant, these were the two departments in which the members were most interested.

The names of Mr. Hill, Mr. Cummins, Mr. Holton, Mr. Woodhouse, and Mr. Buckley were added to the resolution, which was carried with loud applause.

Mr. Newbigging, in responding, said it had been a very great pleasure to him to receive the members and show them round the works. The weather had not been as favourable as it might have been; but still it was a typical Manchester day, and they had seen the works just as they were in their ordinary every-day clothes. He was glad they had included in the vote of thanks the members of his staff, especially as some of them belonged to the Junior Association; and he took this opportunity of recognizing the valuable work they did in their respective departments. As to the carburetted water-gas plant, they could not have any better authority than Mr. Woodhead; and with regard to Mr. Holton, their ex-Hon. Secretary, if they wanted any information about sulphate of ammonia works or acid works, he was the man to give it. Mr. Cummins was the Chief Draughtsman, and had a great deal to do with the new gasholder tank. He was pleased, too, that they had recognized the services of Mr. Hill, the Manager of the Bradford Road Gas-Works. Proceeding, Mr. Newbigging said that he was neither an old man nor a young man. He had lived, as it were, in two decades. He had seen the comparative ease and simplicity of gas manufacture of the past; and he knew of the problems and perplexities that they had to face now. Consequently, he had the very greatest sympathy for an Association like theirs, and he thought it a very happy idea indeed that brought about its inauguration. By such Association, they had opportunities of bringing gas engineering and gas-works management to a higher state of perfection than some of the older engineers had been able to do. In the old times, such visits as they had just taken part in were rare; but the tendency to hold information back was not in evidence to-day. In this respect, he thought that the proposed Chair of Gas Engineering at Leeds University, as a memorial to the late Sir George Livesey, was the best possible one they could have. It would be of great assistance to the younger members taking up gas engineering, and would help them to grapple with all the problems and complexities in maintaining their position in the face of their great competitors on every hand.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Monthly Meeting of the Western District Division of this Association was held in the Technical College, Glasgow, on the evening of Saturday last—Mr. A. H. WHITELAW, of Provan, the President, in the chair. There was a fair attendance.

The PRESIDENT announced that the offer of another medal for the current session had been received—from Mr. D. Vass, of Airdrie; and Mr. A. Smith, of Tradeston, had intimated his intention of giving one for next session. The Council had very gladly accepted the offers. It was pleasant to see so many of the senior members taking so much interest in their affairs. The Council would be very glad to have offers of papers. When so many medals were being presented to them, it was only right that all the members should have an early opportunity of handing in their names as being willing to give papers, even for next session.

LABOUR QUESTIONS.

Mr. S. B. LANGLANDS, the Inspector of Lighting for the City of Glasgow, read a paper with the above title. He commenced by saying it might be a good thing for them all if they were to break away from technical and engineering subjects for the time being, and make the Association a literary debating society. Let them try to discover some of the pitfalls of labour administration, and then talk over how to avoid them. At the outset of a managerial career, they should never let those under them find them vacillating. They should carefully form their opinions, and more carefully act; and then refuse to budge from their position. Councillors might come to them to do this or that, and committees might want them to review their action; but if they were convinced that their doings were honest, they should stick to their guns if they wanted quietude and smooth working. An employer of labour could always be kind and considerate—indeed, he must be; but he should never let any employee run away with the idea that kindness and consideration were softness or weakness on the part of the employer. Drinking during working hours must never be tolerated. They would forgive him for saying that no employer could check a man for what he did himself. Some might say that he had no right to make his paper a teetotal lecture. If he were not convinced that three-fourths of all the labour troubles were occasioned by drinking habits, he would certanly not dwell on the point.

Let them look at their subject from yet another aspect—that of the wages paid. These should always be at the Trade Union rates. They had no quarrel with Trade Unions. They were excellent corporations in the main, and had done an immense amount of good in securing justice and a greater meed of comfort to many. Of course, there were two sides to the question of paying standard rates. If they paid a good workman (say) 36s. (being the standard rate), the Union said the shirker or the less competent man must be paid the same. If this satisfied the good man, companies and corporations had nothing to grumble about. But a manager must often feel that it was hard and unfair to the industrious man; and a solution must eventually be found which would be more satisfactory to all parties. Another point where arbitrary fixing of wages came in was where a man, advanced in years, was compelled to seek employment at his trade. He found it hard to get a situation. A man of 70 years of age could not be expected to turn out an equal amount of work with a man of (say) 40. Yet the Union insisted on his being paid at the standard rate of wages. For the sake of these, and such as these, could not a graduated scale of wages be fixed for men turned 60 seeking employment? A most vexatious *casus belli* between master and man was the misuse of men's Unions on questions of discipline. Say a man had been dismissed justifiably. Very often Trade Union officials got to work to create mischief, and regrettable strikes had been commenced on account of some worthless scamp with a wheedling tongue. Given a sane Trade Union official, the matter could, as a rule, be frankly sifted and probed, and there was an end of it. A manager should at all times be approachable and ready to hear from any or all of his men any grievance, supposed or real. His office must at all times be easy of access. If a quarrel arose between two men, or a foreman and a man or men, let him hear both sides and let them hear both sides. Justice was more easily done in the open.

A cause of annoyance, not so much in gas-works as in the workshops attached thereto, was overtime. There should, as far as possible, be no overtime, as the less there was of it the more employment there would be for all. Overtime often caused shirking—to create it for the sake of the little gain. Set their face against overtime at all times, and they would be helping their company or corporation, and also their men. A likely cause of trouble in smaller gas-works arose from friction between the stokers on the day shift and those on the night shift. One or other of them did not give the necessary attention (say) to their fires, and the make went down. They at first blamed the shift having the low make, only to find that they had low heats left for them owing to defective clinkering of the fires or neglect of flues. When this kind of working started, the manager, or, in larger works, the carbonizing foreman, had to make up his mind to stand over the squads and see what they were up to, and then talk straight.

The subject of "hurt-on-duty pay" was now so definitely fixed under the Workmen's Compensation Act that it was almost unnecessary to dwell on it. In every case insure; and then see to it that both their employers and the men got fair play from the Insurance Company. If the period of absence from duty was too short to be covered by the Act, treat the men as they themselves would like to be treated. If, after this treatment, they found any malingering, have no mercy on the malingerer, as he was damaging not only himself but his fellow workmen also. These were a few possible pitfalls. Let them get away from contentious labour questions, and examine for a little how they could eliminate trouble and create harmony. They all had their duty to do in this matter—capitalist and employee, master and man, manager and those under him. They had each and all to recognize that they were their brother's keeper and must bear one another's burdens.

There had been many attempts made to obtain interested work and to stamp out the "Come night come ninepence" attitude of a man to his day's darg. The efforts had mostly been unsuccessful because they did not effect a permanent benefit to the employee. One manager of a small works arranged to give his stokers so much in money for each time they obtained a certain yield of gas per ton of coal carbonized. This could only be partially successful. Another arranged a bonus to each employee on the year's profits—increased profits, increased bonus. Others paid a bonus on every extra consumer obtained, every extra cooker fitted, &c., &c. These arrangements, however good, were, after all, only tinkerings at a great question. They had all to recognize early that the management of a works must be done with a wider vision—a wider horizon. Every man employed must feel, or be made to feel, that he was a necessary wheel in the whole mechanism—that if he dragged he hindered, and that then a new wheel must be obtained, as the whole true movement must not be disorganized. This was what Sir George Livesey recognized when he worked out, bit by bit since the year 1889, his splendid scheme of co-partnership, by which every man's interest was nurtured and secured as well as the Company's.

Co-partnership was no new growth. Fifty years ago, M. Le Claire first established the principle; and in 1878 a Society was founded in Paris "for the practical study of various systems under which workmen could participate in the profits." Le Claire asserted that the stimulus given to the profit-sharing worker must create the additional profits which they were to receive. But there was possible profit elsewhere, because every man being interested in a monetary way would cause more work to be done. He would also cause less waste of material and greater care of the machines and tools which he was using. Of course, first of all, the master must have a fixed minimum percentage on his capital; then provision must be made for the loss by tear and wear on the plant, and for on-costs. Beyond this the profit was divided between master and man. The master must always bear the burden of times of depression; hence the necessity for interest on his invested capital. It had been found that the work done had almost always been in a direct ratio with the extent of the interest of the worker. Co-partnership had been tried in England before Sir George Livesey's time, but had not been successful, because of English prejudice and the known greed of the capitalist. They were always wanting very much more than they gave; but it had been clearly demonstrated by Sir George Livesey's efforts that his scheme of working could be made of benefit to all the parties concerned.

After a brief description of the profit-sharing scheme of Sir Christopher Furness, the author proceeded: I do not know if you noticed the composition of the platform party at the recent meeting of the Labour Co-Partnership Association. It was really most significant. The President was the Right Hon. Arthur J. Balfour; and most of you, I hope, have read his speech. Some of the other speakers were Sir Christopher Furness, who is a Liberal, Mr. Shackleton, a Labourist, and so on and so on. Those three represent the different political parties in the country (so far, I do not see the women or the Nationalists taking part in the work of the Association). The Secretary of the Association is H. Vivian, a Welsh Liberal. One welcomes this as a sign of the times. The futility of party squabbling, the finessing of political wire-pullers, and the silly mouthings of parliamentary irresponsibles, are slowly but surely being assessed at their true value. I will not be more specific on the co-partnership question in relation to companies, as there has been plenty written and published to guide any manager of a company who thinks of adopting a co-partnership scheme—in fact, all over England at present gas companies are adopting some scheme or another of their own along these lines. What I want to see is if something can be done for corporation employees in a similar way; and I await with intense interest Mr. Hubert Pooley's findings on the subject of its adaptability for the Stafford Corporation gas employees.

It should not be so very difficult to build up a system of co-partnership in corporation gas-works; and, as a suggestion, might I advocate the formation of a small Committee of this Association to study the *pros* and *cons* of the matter, just as our seniors appoint Committees to conduct research on technical matters of moment, or Committees to safeguard commercial interests. Corporation gas-works are, after all, conducted on very similar lines to company works. The initial basis would require to be the fixing of a fair price for gas to the consumers, taking into account the environments and situation, or the geographical position of the gas-works. This "fair" price would, of course, be always subject to some alteration, in direct ratio to the price paid for materials for

production, *minus* labour—that is, supposing a fall in the price of coal, then the extent to which this affected the price of the gas would be calculated. Then a fixed amount might be arrived at for sinking fund and depreciation charges. The difficulty is, you will say, that you cannot turn the workman's increment of profit into capital holding. Well, I don't admit that this is insurmountable. The corporations as a whole borrow money on a consolidated basis, at, let us say, 3½ per cent., to do certain work. The gas departments obtain loans or capital therefrom to do certain work; repayment being spread over so many years. This stock could be partly held by the employees, up to a fixed amount. Then, in addition to the ordinary interest on it, the gas department could add, as extra interest to the 3½ per cent., what is earned in each year through and by the interested work of the employees—keeping always the year of inauguration as a basis of calculation. The amount of corporation stock held could be raised by each employee subscribing 10 per cent. of his wages until the sum fixed upon as his limited possible holding was reached. The employees would require to be allowed to form a small Committee among themselves to safeguard their interests and to submit to the gas committee any matters of moment which might arise from time to time.

My subject has, perhaps, been too radical a departure from those usually dealt with; but, again, I insist on its importance to each and all of us. Just now we are in the trough of the wave, as far as employment goes, not carried buoyantly along on the crest by a surplusage of it. And times like these compel thought on matters affecting our fellow workmen.

There are many other questions on which I would like to have dwelt, such as award schemes for improvements by employees on tools and machinery, and schemes whereby employee's patentable ideas are conserved and protected for him at the expense of the employer, both sharing in the benefit derived. But I do not want to make the discussion too wide. One other point might have been touched upon, one which I would like to commend for consideration—that is, the question of superannuation. It must be faced sometime.

Discussion.

Mr. W. M. Mason (Glasgow) expressed his thanks to Mr. Langlands for bringing before them the subject of his paper. The question of co-partnership was well worthy of attention. So far as companies were concerned, it had been proved to be an excellent thing; but it was another matter where corporations were concerned. In Glasgow, they might convert the 25 or 27 members of the Gas Committee; but it would be a different matter to convert the 75 members of the Corporation. However, he thought, from a practicable point of view, the proposal was a good one.

Mr. R. Shepherd, jun. (Glasgow), was surprised at the amount of malingering and shirking alluded to in the paper. They were aware that there were shirkers in the world; but he took it that the average man would work if he could get it to do. It must be a sight familiar to all of them at the present time, that when work was to be had, there was a rush to get it. If a scheme of co-operation could be devised, it would be a safeguard for the men inside the works; but a much greater scheme lay outside. He did not see how this problem was to be solved.

Mr. F. L. M'Laren (Dumbarton) remarked that a writer in an engineering magazine said that increased efficiency could be obtained by improving the *personnel* of the works, and getting more out of them. Different methods had been tried to obtain this, such as piecework and bonus systems. These had been blamed for causing a great many of the strikes and disputes which had arisen; but it was because they had shown up how much more the average man could do when he wanted to do it than what he did when he was not particular whether he did it or not. Mr. Langlands would be well compensated for his trouble in preparing the paper if he got a majority of the members of the Association to set about having definite ideas upon the subject of it, because, after all, if a manager of a works, no matter how well he knew his business, came to be at daggers drawn with his workmen, all his ability went for nothing. It was an axiom in life that one man could not work alone; men had to work in union.

The President remarked that they were pleased to have with them Mr. Walter Grafton, who, he hoped, would be able to enlighten them upon Sir George Livesey's co-partnership scheme, because many of them on that side of the Border knew little about it.

Mr. Grafton expressed his obligation for the invitation, but said he was afraid he could not explain the scheme as he was not fully acquainted with it. He was present rather as a guest than as a speaker; and he therefore hoped the members would excuse him.

Mr. J. Fraser (Provan) said one of the points to which he wished to refer was that Trade Unionists had always fixed the minimum wage, but never the maximum. Therefore, if a manager did not pay a good man, he deserved to lose him. On the question of malingering, he had gone pretty much into the Workmen's Compensation Act; and, so far as the Glasgow Corporation were concerned, it was quite a dead letter. It took two or three years to discover a malingerer; and the Act in no way covered this. He found it was always beneficial to be in touch with the workmen, but never to make themselves too cheap with them. He had had experience of piece-work and bonus systems, and both were unsatisfactory. Under them men would do more, but they would never find these men live to a ripe old age. Piece-working and bonus systems were, in his opinion, similar to the running of a low-pressure plant on a high-pressure system—its life would be reduced by 50 per cent. These systems certainly did not benefit the workmen; hence the number of widows and orphans at the present time in Glasgow.

Mr. J. Murray (Glasgow) asked for information regarding the co-partnership schemes of Sir George Livesey and Sir Christopher Furness.

Mr. A. Smith (Tradeston) said he was of opinion that if a scheme of co-partnership could be devised for corporation employees, work would be more satisfactorily done. If they had in the works men with an interest, waste would be greatly reduced. The difficulty was to say what such a scheme should be. If he remembered rightly, the late Sir George Livesey was asked, in the course of a discussion, whether there could be such a thing as profit-sharing in corporation works; and the answer was in the negative. The problem was a very difficult one to solve; but anything that would make for peace and amity between master and man was greatly to be desired.

Mr. J. A. Smith (Glasgow) referred to drinking customs as being a great annoyance in all works. As to the co-partnership system, he asked whether the idea generally entertained was the reduction of labour, the improvement of the workers, or the saving of material.

Mr. J. Fraser inquired if it was not the case that ratepayers were co-partners in the gas-works, and had power to take up the question of profit-sharing? The Electricity Department in Glasgow had been hanging round the neck of the Gas Department for some years. It was rather hard upon gas consumers that they should be burdened with the money required for the Electricity Department, which might be employed for superannuation or other purposes.

The President, in proposing a vote of thanks to Mr. Langlands, said the author had done the Association a great service in opening up the large question of labour. It was one that they would have to face, sooner or later, and one in which, if they were good citizens, they were bound to take an interest. He thought Mr. Langlands struck the keynote of the thing when he spoke about being their "brother's keeper." As a matter of fact, this was really the only definition of Socialism he would accept. The social question was, he might almost say, a moral and a religious one. He was a strong believer in Trade Unionism, as he thought nothing had done so much good for working men in this country as Unions. He did not say that everything in the constitution of Trade Unions—as, for instance, the authorizing of a limit to wages—was to be commended. He did not think they had a right to fix either a maximum or a minimum wage. He considered this should be elastic on either side. If a man were possessed of great talent and exceptional ability, and a master was inclined to be generous to him, there should be no limit. It was the same with regard to paying less to a man who, through age, was not capable of turning out the same kind of work as formerly. He was glad to think that a better feeling was creeping in between masters and men. If anything was to be done for the workers in corporation works, it lay along the line of superannuation. This was really the only way in which a corporation could approach the subject.

Mr. Langlands, replying to the discussion, said it was for the improvement of the workers that he was acting. If they could get a scheme whereby they were able to have good, efficient, and cheap labour, they would be in a position in which they could enter into competition with everyone. Let them make an effort in some way or another, and show the men that they were thinking about their welfare. The question of superannuation might come as soon as it liked; he was all for it.

The President said they would think over the question of the formation of a Committee such as Mr. Langlands had suggested in his paper.

Yorkshire Junior Gas Association.—A meeting of the Association will be held at the Municipal Technical College, Bradford, next Saturday, when the President (Mr. H. Butterfield, of Silsden) will deliver his Inaugural Address; the Hon. Secretary (Mr. Charles Roper) will contribute some notes on the public lighting of Bradford; and the members will inspect the installation of gas and electric lighting in Manningham Lane.

The London and Southern District Junior Gas Association have found it necessary to make a slight alteration in the arrangements as given on the programme issued at the beginning of the session. The visit to the Kensal Green works of the Gaslight and Coke Company will take place next Saturday, instead of in February as previously arranged; and it is proposed to reserve February for a visit to Woolwich Arsenal—the exact date to be announced later. The party will assemble at the entrance to Kensal Green Gas-Works next Saturday afternoon at about 2.45.

Water Purification by Ozone.—The purification of water by means of ozone is conducted at Chartres, a city of 23,000 inhabitants, by plant recently put in operation. The water is taken from the Eure, passed through coarse preliminary filters, then through sand filters of the mechanical type, and finally through ozonation towers, where it is sterilized before delivery to a covered reservoir. The process used is that of M. Otto, the Chief Engineer of the Compagnie Générale de l'Ozone, of Paris. The new plant is a municipal undertaking; and it is stated that the ozone is being produced at a current expenditure of 1 kilowatt-hour per 22,000 gallons of water sterilized.

NATURAL & ARTIFICIAL PURIFYING MATERIALS.

We have received from Herr Friedrich Lux, of Ludwigshafen-on-the-Rhine, a copy of a very interesting dissertation by him on the artificial purifying material which is identified with his name. A summary of the principal points made by the author may be interesting to readers of the "JOURNAL."

It is pointed out that whereas in the earliest days of the gas industry an artificial hydrated oxide of iron was not uncommonly used for the purification of gas, it was subsequently superseded by the natural bog iron ores. Now, however, there is a tendency to revert to artificial purifying material. The Lux preparation consists of a hydrated oxide of iron containing in an intimate state of combination a certain amount of free alkali. It is prepared from the French mineral, bauxite, by heating it with soda and then extracting the fused mass with water. The compound of the alumina of the bauxite with the soda thereby passes into solution, while the hydrated ferric oxide remains and retains in its interstices a considerable proportion of soda. The function of the soda in the material appears to be to act as a carrier of sulphur to the hydrated ferric oxide, and the result is that the material acts more vigorously for the absorption of sulphuretted hydrogen than a pure hydrated oxide of iron. The Lux material in its ordinary state is free from matter which takes no active part in the absorption; and on this account it is capable of absorbing ultimately a larger quantity of sulphuretted hydrogen than the natural bog ore, which is loaded up to a considerable extent with root fibres, and other organic matter. The root fibres, however, as is well known, serve the purpose of lightening, or loosening, the hydrated oxide, and thereby rendering its particles more accessible to the gas.

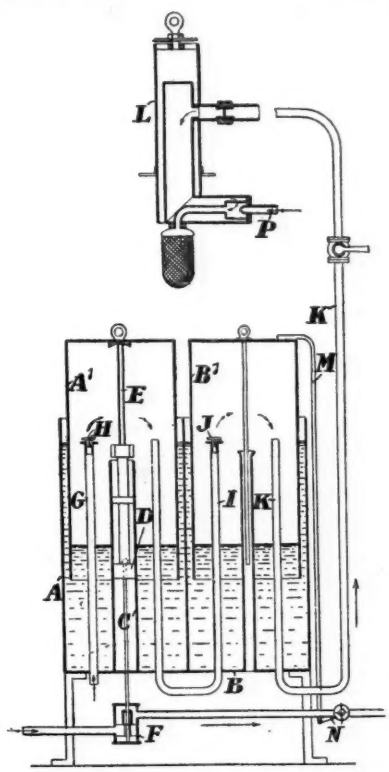
In some cases it is considered desirable to add to the Lux material a certain proportion of coke breeze, sawdust, or other lightening material with a view to facilitating the passage of gas through it. The artificial material as bought may commonly be more costly than the same weight or bulk of bog ore; but when it is lightened by the addition of coke breeze or sawdust, a given bulk of it will cost much about the same. The Lux material before the addition of sawdust or breeze weighs something under 13 cwt. per cubic yard; and one cubic yard is stated to be adequate to deal with about 500,000 cubic feet of gas before it needs revivification. Revivification is completed under normal conditions in twenty-four hours at the most; and the material may be revivified thirty to forty times without appreciable decrease in its activity. When the spent material is to be worked up for the production of Prussian blue, sawdust constitutes the best lightening agent; but when the spent material is to be applied directly to the production of sulphuric acid, the lightening should always be effected by means of coke breeze.

It is claimed that in most cases, even where the initial cost of the artificial material is considerably greater than that of bog ore on account of higher freight charges, the cost of purification will nevertheless be lower. Examples are given for different relative prices of the two materials. For instance, when the artificial material costs twice as much per cubic yard as the bog ore, and the cost of emptying and re-filling the vessels and of handling the material for revivification is taken into account, together with the value of the gas lost at each opening of the vessels, it is shown that the total charges for purification become equalized when the artificial material has been revivified twenty-three times compared with forty times for bog ore—*i.e.*, for every 1000 cubic feet of gas purified by the bog ore without revivification, the artificial material must purify some 1740 cubic feet of gas. It is, however, claimed that this is well within the purifying capacity of the artificial material as compared with the bog ore. Consequently, on this assumption, the Lux purifying material at double the initial price of bog ore should show equal charges for purification when it has been in and out of the vessels twenty-three times, and thereafter should show considerable saving. It is further stated that, bulk for bulk, the Lux material purifies at each filling of the vessels twice as much gas as bog ore; and if this is the case, and the bog ore costs only three-fifths as much as the Lux material, there should be a saving of 15 per cent. in the cost of purification if the purifying capacity of a cubic yard of bog ore is taken at 7 million cubic feet of gas. It is claimed, however, that whereas the bog ore would in these conditions be completely spent, the Lux material would yet retain sufficient activity for further use for a considerable time. These computations are made without regard to the enhanced value of the spent artificial material due to the greater proportions of sulphur and Prussian blue which it contains. They depend solely on the saving in cost and in wages due to the less frequent changing of the purifiers.

Attention is called in the dissertation to the researches of Herr Kunath on the rate of flow of gas through the purifiers, by which he demonstrated that a higher rate of flow was safely permissible with the Lux material than with bog iron ore (see "JOURNAL," Vol. CI., p. 223). Reference is also made to the figures reported by Dr. L. J. Terneden, the Chemist to the Amsterdam gas undertaking, in regard to the use of the Lux material at the West Gas-Works at Amsterdam. These results, and an epitome of a subsequent discussion on them, have already been given (see "JOURNAL," Vol. CII., p. 105; and Vol. CIV., p. 263). Herr Lux concludes his remarks by pointing out that the use of the best material in gas purification affords a guarantee of peace and security in the conduct of that important operation in the routine of gas manufacture. We understand that the Lux material is being used in at least two English gas-works at the present time.

COMBUSTIBLE MIXTURE FOR INCANDESCENT LIGHTING.

A patent has been taken out in France by M. Antoine Bouvier for a process for the application to incandescent gas lighting of a combustible mixture, composed of gas and air or other inert fluid heated to a high temperature, and supplied under pressure. The union of the two fluids is effected either in the burner itself or in a separate mixing-chamber; and combustion takes place in the ordinary way. As, however, the mixture is rich in oxygen, it possesses a much higher illuminating power than ordinary gas; and the patentee therefore claims that its employment would result in economy. Air is preferred to every other gaseous fluid; and it may be compressed by any suitable means to from 4 to about 24 inches of water.



The accompanying illustration shows an apparatus for carrying out the invention. The air-compressor is formed of two water vessels A B, furnished with bells A^1 B^1. In the centre of the vessel A is a sheath C, in which moves a piston D, the upper part of which is prolonged by a rod E extending to the crown of the bell A^1. This piston will move up and down in the sheath under the action of water supplied by the pump F. The outer air is led into the vessel A by a pipe G, closed at its upper part by a flap-valve H. From this vessel it passes into the other by the tube I, which is also provided with a flap-valve J; and it is thence conveyed by the pipe K to the heater-mixer L. The water issuing from the pump pushes up the piston D and raises the bell A^1; whereupon air is drawn in by the pipe G. When the water flows from the pump, the bell A^1 descends by its own weight, and compresses the air it contains, which is conveyed by the tube I into the bell B^1, causing it to rise in its turn. In so doing, it actuates a rod M connected to the key of a tap N, which it closes. The water contained in the pump F being unable to flow away, the bells retain their position so long as there is no fresh supply of compressed air. The bell B^1 contains air at a certain pressure, which is conveyed to the heater-mixer L, where it mingles with the gas supplied through the pipe P.

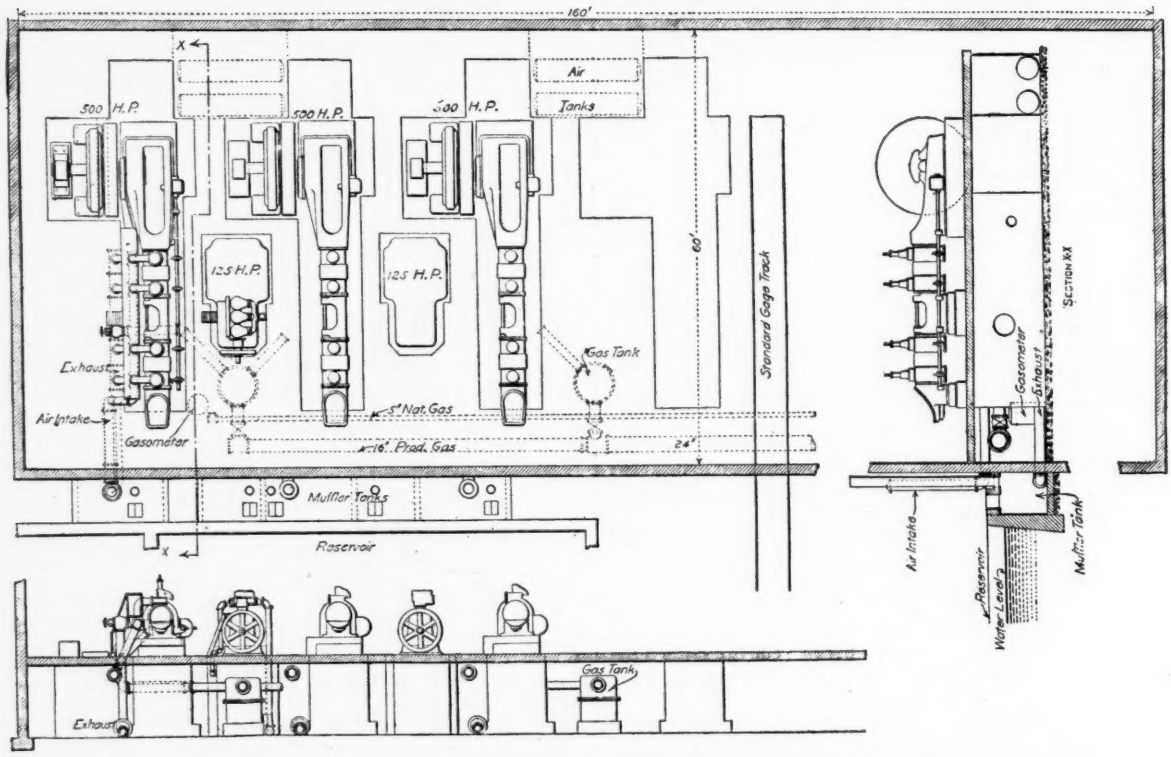
A correspondent, writing from Omaha, Nebraska, sends the following encouraging observations on the present position of things in America: "The financial depression of a year ago has now in great measure subsided; and crops are good. We in this great central valley of the Mississippi and Missouri have not felt the hard times; and the sale of gas shows handsome (say, from 10 to 25 per cent.) increase with us. We, the large majority, are happy over the late election, and have absolute faith in the character, integrity, and experience of the President-Elect. He has had the most Judicial and Executive experience of any President before him; and we look forward to four years of prosperity."

LARGE INSTALLATION OF GAS-POWER PLANT.

There has lately been brought into operation at the works of the Union Switch and Signal Company at Swissvale, near Pittsburgh (Pa.), a 1750-H.P. gas-engine power plant, which is claimed to be the first installation in America of gas-engines solid-coupled to 60-cycle alternators working in parallel. The plant is part of an extensive overhaul of the establishment in order to obtain increased capacity. The power was originally furnished from a 385-H.P. steam plant, which was subsequently supplemented by vertical gas-engines; the equipment finally aggregating 1180-H.P. The construction of a large foundry and a forge shop made it desirable to build a central station with ample capacity for both present and future power requirements. Owing to the present abundance of natural gas in the vicinity, and the possibility of using producer gas in case of any scarcity of the former, it was decided to instal a gas-power plant. Accordingly, the engines have cylinders for producer gas, and the piping was designed for the use of this gas at some future time. Connections for natural gas have been fitted as an auxiliary supply. The following particulars of the plant are taken from an illustrated description in a recent number of "Engineering Record."

As the expected load from the extended works will be large, three tandem engines of 500-H.P. capacity have been installed, with two 125-H.P. engines for night and auxiliary service. The power-house has been laid out for double this capacity; and the foundations for the next large unit have been placed. Space has been provided at one end for a producer-house. The power-house is a 60 ft. by 160 ft. single-storey steel and brick structure, with a clear head-room of 24 feet and a basement of 11 feet. The concrete wall and engine foundations are carried down about 3 feet below the basement to a hard, compact shale. The roof is covered with 2 ft. by 4 ft. interlocking reinforced concrete slabs, fastened by lugs at their upper ends, hooking over the flanges of 6-inch channel purlins, spaced 4 feet apart. The monitor is similarly covered, and special ridge slabs are used for the peak and the corner ridges of the roof. There is a 15-ton electric travelling crane, 56 ft. 10 in. span, working 17 feet above the floor level.

The three large units are two-cylinder double-acting engines of the horizontal tandem type, built by the Westinghouse Machine Company, and connected direct to 340-kilowatt two-phase generators without the use of spring couplings. They have $23\frac{1}{2}$ in. by 33 in. cylinders, and are rated at 500-B.H.P. at 150 revolutions per minute, though they have actual capacities for overloads ranging up to 600-H.P. In fact, it has been necessary to limit the travel of the governor valve to prevent destructive overloading of the generators, which are at present in operation on natural gas of an average calorific value of about 950 B.Th.U. per cubic foot, but are designed for working satisfactorily, when required, with the comparatively lean producer gas of 125 B.Th.U. The engines are fitted with 13-feet fly-wheels, weighing 30 tons each. The two smaller units are Westinghouse vertical engines of the three-cylinder single-acting type, direct-connected to 75-kilowatt



Plan of New Gas-Engine Station—Showing Arrangement of Muffler Chambers and Reservoir.

two-phase generators through flexible spring couplings. They have 13 in. by 14 in. cylinders, and operate at 260 revolutions per minute; their rating at this speed being 125-H.P. There is also a small vertical gasoline engine fitted in the basement, with a belt-connected air-compressor for filling the air storage-tanks if the supply of compressed air from the works (normally used in starting) should fail.

An automatic compressed air starting system is provided on all five engines; the air supply from the tanks in the basement being utilized to turn the engines over until the initial charge ignites. The large engines have unbalanced poppet-valves connecting into either end of each cylinder, which are so located in relation to knock-off cams on the lay shaft that at least one valve will be held open to admit air into the cylinder. In starting, the air pressure is thus merely admitted to the valves, which, being unbalanced, will close upon their seats unless held open by the cams, which so time the admission as to cause the engine to turn over. The air admission is on the power stroke of the cycle only, in order that the air may be released on the following or exhaust stroke. The air supply is stored in four cylindrical steel tanks, 2 ft. 6 in. by 15 ft. in size, in the basement, and piped to the engines and the compressor in the basement by a 4-inch line. An auxiliary supply at 80 lbs. is provided by a 4-inch line from the air system supplying the works. It is noteworthy that these engines are ordinarily started on 80 lbs. pressure, or less, with ease and certainty.

The lubrication of the engine is accomplished by both forced feed and gravity feed in combination; the former being used for the cylinder, valve stem, and rod lubrication, and the latter for all the open bearings. There is a four-feed mechanical oiler for each cylinder end. These are link-connected to the valve eccentrics. Each has two main cylinder feeds—to the exhaust-valve stem and to the piston-rod stuffing-box respectively. The gravity system embraces thirteen feeds—five for the crosshead slides, two to the crosshead and crank-pins, two to the cross shaft for the lay shaft drive, and the remaining four for the main crank-shaft bearings. The oil is supplied from an elevated tank, to which it is pumped from filter-tanks in the basement, where the surplus oil flushed through the bearings is collected. This is done by geared force-pumps driven direct from the engine lay shaft. As a single valve controls the main oil circuit to each engine, the adjustment of the various feeds, once set, need never be changed; so that with this system the consumption of oil is practically limited to evaporation, renewals, and waste.

Cooling water comes from a large storage basin and elevated tank forming part of the fire-protection system for the shops; the underwriters having required for this purpose a storage reservoir of 500,000 gallons capacity, in addition to the usual gravity tank. The reservoir has three concrete basins, each 30 feet by 60 feet in plan and 14 feet deep, adjoining the power-house. The wood elevated tank holds 21,000 gallons, and is mounted on a steel tower 90 feet high. The cooling water is piped to the engine-jackets from the elevated tank, discharged from them to the reservoir, and from the latter pumped back to the elevated tank by an electrically-operated centrifugal pump of 400 gallons capacity

per minute, with a 1000-gallon steam-pump in reserve. Adequate cooling is effected by discharging the hot water from the jackets first to the middle compartment of the reservoir and thence alternately to either one of the end compartments if necessary. It is impossible to determine whether convection, evaporation, or earth absorption plays the greatest part in cooling; but the indications point to the last.

The piping systems of the plant consist of a 5-inch natural-gas line for present use, a 24-inch producer-gas line installed for future operations, and a 16-inch air-intake line for each of the larger engine units. The natural gas is fed at from 10 oz. to 18 oz. pressure with 36-inch gasholder pressure-regulators, which deliver the gas to the large engines at atmospheric pressure. Between the gas-supply line and each of these engines is interposed some receiver capacity in the form of a cast-iron tank designed to relieve the gasholder reducing-valve of the extreme fluctuations caused by the intakes in the recurring cycles. This valve is in the form of a simple butterfly valve controlled by the gasholder. The gas connection to each large engine is a 10-inch line, which leads to a manifold above the floor for the inlet-valves. The exhaust piping consists of 8-inch connections from each of the exhaust bonnets to a 20-inch exhaust header, arranged alongside the engine foundation, which reduces to a 12-inch outlet near the building wall.

On account of the proximity of the works to an extensive residential district, it was necessary to silence the exhaust; and for this purpose muffler chambers have been built into which the exhaust gases are discharged before they escape to the atmosphere. The chambers are formed by reinforced concrete end walls and roof between the foundation wall of the power-house and the concrete wall of the water-basin. For the large engines they are 6 ft. by 12 ft. inside measurements, and 6 ft. 6 in. deep. Into this enclosure extends the 12-inch outlet from the exhaust header of the engine, terminating in an elbow, discharging horizontally across the chamber, which causes the exhaust to double-back upon itself before passing to the atmospheric outlet—a 12-inch riser leading above the roof. There are explosion doors in the top of each enclosure, each a two-part hinged iron door, to provide an opening 2 feet square, which in cases of possible after-fire in the exhaust line may fly open to relieve the pressure. The roof and end walls of the tank are stayed for protection against these possible explosions. These chambers muffle the exhaust, without back-pressure on the engines, so that the noise of the exhaust is less noticeable than that of the air intake.

The engines are of the side-crank type, with all valve motions operated from a lay shaft at the side of the bed-frame; both inlet and exhaust valves at either end of each cylinder being operated from the same eccentric. The inlet-valves are all of the new Westinghouse type, combining the functions of inlet, mixing, and governor valves in a single mechanism. The ignition system has double insulated igniter plugs, no part of the ignition circuit passing through the frame of the engine; and there are two igniters in either end of each cylinder. These are of the make-and-break type, fitted in cages or plugs seated with copper-asbestos packing, permitting easy removal. They are operated from 110-volt direct-current circuits; the induction coils for each of the plug circuits being fitted with clapper armatures to serve as tell-tales to indicate the proper action of the various igniters. On these engines, however, the make-and-break actions of the igniters are mechanically operated from a small auxiliary lay shaft, parallel to, and slightly above, the main lay shaft, and driven from it by a cross bevel-gear connection. The speed regulation is by a sensitive centrifugal governor, which operates through oil-pressure relay cylinders having linkage connections to the inlet-valve cut-off sleeves. The engines have automatic safety stops, consisting of centrifugal plungers in the rims of the fly-wheels, which open the ignition circuit in case of any excessive speed of the engine.

The station is designed to furnish two-phase alternating current at 60 cycles and 220 volts; the generators connected to the three large units having 340 kilowatts capacity, and those to the two small engines 75 kilowatts capacity. The governing characteristics of the engines are such that no difficulty is reported in running the generators at parallel in any combination of both the large and small units over the complete range of load, as determined by extensive preliminary tests. Exciting current for the large generators is provided by two motor-driven sets—one a 75-kilowatt dynamo and 125-H.P. motor, and the other a 25-kilowatt dynamo and 40-H.P. motor. The exciters for the small generators are driven by belts from the fly-wheels of their driving-engines, and are 5-kilowatt dynamos. The ignition current for the plant is supplied by a duplicate set of 1-kilowatt motor generators wound for 110 volts.

Expansion Joints in Retaining Walls.—Interior bond of V-shape between adjoining sections of retaining walls have sometimes given trouble on account of one of the sides of the mortised portion cracking off when the adjacent monolithic sections of the wall have settled unequally. For this reason the constructors of an American railroad, in building retaining walls, made the expansion joints without any interior projection, holding the walls in line by short pieces of old rail extending from one section into the other. In order to allow expansion, the end of the rail in one section was wrapped with tar paper. The scheme allows expansion and contraction, but keeps the sections both to line and grade.

PETROL GAS.

[Two Papers Read before the Royal Scottish Society of Arts.]

At the Third Meeting for the session of the Royal Scottish Society of Arts, held in Edinburgh, on Monday, the 14th ult.—Mr. W. Allan Carter, of Edinburgh, in the chair—papers were read by Mr. W. SHEARER, of Edinburgh, on "An Improved Apparatus for Producing Petrol Gas for Lighting and Heating Purposes," and by Mr. WILLIAM KEY, formerly Manager of the Tradeston Corporation Gas-Works in Glasgow, entitled "Notes on the Centenary Air-Gas Turbine Generator." The last-named plant was described and illustrated in the "JOURNAL" for the 1st ult., p. 639.

Mr. SHEARER, in the course of his paper, said that one of the most perplexing problems affecting those who resided in country districts was the selection of a suitable illuminant. Many systems of lighting had been tried; but they had all proved expensive to keep up, troublesome, and, in some cases, dangerous. The only practical method to the hands of people with moderate means was the oil-lamp. But this, apart from the disagreeable odour always present with the use of paraffin, had proved a dangerous method of lighting, judging from the statistics of fires, which showed that more fires had been caused by accidents with oil-lamps than by any other means. In recent years, however, with the popularity of the motor-car, petrol had come into universal use; and petrolized air gas having been found to be an ideal illuminant, when used with a mantle, the attention of inventors had been drawn to the designing of suitable plant for automatically generating this gas. Owing to the ease with which petrol gas could be made, and the small amount of power required, it was certain to occupy a very prominent position in the near future as a means of lighting private dwellings and other buildings beyond the reach of the public supply of good and cheap coal gas or electricity.

The object of all machines or plant designed for generating petrol gas was to mix or evaporate petrol with air in correct proportions, so as to form what was termed petrol safety air gas (a non-explosive mixture), and to do this automatically, whether the generator was required to supply a large or a small number of lights. This proportion was, approximately, 98½ per cent. of air to 1½ per cent. of the petrol vapour. The resultant flame produced by this mixture was non-luminous, but produced a most intense bunsen flame; so that the system was essentially one of incandescent lighting. It was necessary, however, to point out that all petrol gas was not a safe gas. It might be dangerous if more than a certain proportion of petrol was mixed with the air. Petrol gas was by no means a new thing, as the use of the lighter hydrocarbons for making gas was tried about eighty years ago. The reason for its non-success then was that the burners used were of the luminous type, and the gas therefore had to be made rich enough to produce a luminous flame. This meant that a very large proportion of hydrocarbon was required to be mixed with the air, and with the varying quality of the spirit used, and the inadequate carburettors employed, a great deal of difficulty was experienced in maintaining a uniform light. The introduction of the incandescent mantle, however, did away with the necessity for producing a luminous, and therefore rich, gas, and at once reduced the proportion of hydrocarbon necessary in the generation of a weaker mixture, and thus facilitated the ease with which evaporation could take place.

Whenever evaporation took place, there was a certain amount of heat absorbed, or rendered latent; and this heat was abstracted from the surrounding or adjacent objects. Thus, when evaporation was effected from the surface of a large quantity of petrol, the process of evaporation greatly reduced the temperature of the petrol left. So much was this the case, that if two gallons of petrol were placed in a tank, and air blown over the surface, at a sufficiently rapid rate, until one gallon was completely evaporated, the temperature of the remaining gallon of petrol would be reduced to about 20° below the freezing point of water. It was a well-known fact that the colder petrol became, so did its density increase, and, consequently, evaporation became more and more difficult. The best means of carburation to employ was that in which minute quantities of petrol were introduced into a properly-designed carburettor, where it should meet its exact equivalent of air to produce the gas required. Petrol air gas, as had been already stated, produced an intense bunsen flame, and that without any additional air being required at the burners. Where atmospheric, or air-inlet, burners were employed, the gas generated was a rich, and therefore not a safe, one. When properly generated, petrol safety gas was the cheapest, safest, and cleanest gas that was at present known; while the products of combustion were only carbon dioxide and water vapour, entirely free from sulphur compounds, smoke, or smell. It was absolutely non-poisonous, had no detrimental or corrosive effect upon metals, and did not discolour ceilings or decorations. When properly generated, it was perfectly safe, as it could not be lighted except when passed through a suitably constructed burner. An escape of gas, so pernicious where other gases were concerned, was harmless in the case of petrol gas. It could be used for heating purposes, and vessels placed over the flame did not get sooted.

The price per 1000 cubic feet depended upon the strength of

the mixture employed. Some machines made 500 cubic feet of gas from a gallon of petrol, costing about 1s. 4d.; while others made 1500 cubic feet of gas from a gallon. In the first instance, the cost per 1000 cubic feet was 2s. 8d.; while in the second it worked out at about 10½d. These figures were misleading to the general public, because they might fairly assume that the machine making 1500 cubic feet per gallon was superior to the one producing 500 cubic feet. It must, however, be remembered that a gallon of petrol contained a definite amount of heat, which was stored up in it as chemical energy, and that when the gallon of petrol was mixed with a quantity of air, the energy was equally distributed throughout the air. Then the quantity of heat procurable from a cubic foot of carburetted air would depend on the proportion of petrol vapour which it contained. So that to produce the same heat effects in a burner, and consequently the same amount of illumination, a larger quantity of gas was needed to be used with a weak mixture than would be where a richer mixture was employed. It would, therefore, be clear that a definite amount of heat was procurable from a gallon of petrol, irrespective, within certain limits, of the quantity of air supplied with it. The quantity of air must be large enough to secure complete combustion of the petrol, but not so large as to make the gas too weak to be ignited. The correct quantity of air supplied to a gallon of petrol should, as previously stated, be such as to produce a non-explosive mixture; and this, as near as he could judge, was about 1000 cubic feet per gallon. The cost of 1000 cubic feet of air gas, therefore, would be about 1s. 4d. With this mixture he had lighted twenty burners, of from 40 to 50 candle power for 8¼ hours, from one gallon of petrol, which worked out at about a 50-candle power light for 170 hours for 1s. 4d.

The "Solux" generator had been designed to ensure simplicity, with automatic action, effectiveness under all atmospheric conditions, adaptability to making and supplying gas to either one or a full number of lights without variation in the quality or pressure of the gas, and with its component parts easily detachable. There was safety, not only from the possibility of forming an explosive mixture, but also from any chance of the petrol itself igniting; there was no loss, nor waste of water or petrol when not in use; and there was perfect evaporation of the petrol under all conditions of working. Although he would not advocate the introduction of petrol gas where already good coal gas existed, there were many instances where coal gas was prohibitive in price and, owing to the small output, very bad in quality. By employing the existing gasholder for the storage of air, many of the very small coal-gas works could, by means of the "Solux" generator, be easily transformed, at a minimum of cost, into an ideal installation for making petrolized air gas. The generator depended upon a supply of air at a pressure of only 6 to 8 inches. After this, it acted entirely automatically—only generating air gas as it was required. When no gas was being drawn off, generation ceased, and the plant remained at rest, but ready to respond to any demand for gas. The air entered through a meter, and was measured by a revolving drum, the spindle of which worked the regulator in the petrol-tank. In this way, whatever quantity of air was being passed, the exact equivalent in petrol was maintained, and therefore the mixture and strength of the gas remained the same under all conditions. After passing the meter, the air was sent through a drying chamber containing lumps of calcium chloride (which required renewal every three or four months), then through a pressure-regulating diaphragm governor, and thence to the carburettor. In the carburettor the petrol flowed on to the surface of a sphere or ball, and the air was made to swirl round the ball in such a manner as to completely evaporate all the petrol introduced; and at the same time, by means of suitable vanes, the gas formed was churned up, ensuring a uniform density of mixture. The tendency of the evaporating surfaces to become cold was entirely eliminated by providing projecting vanes on the obverse side of the evaporating surfaces, similar to motor-car radiators. Evaporation took place in the carburettor under the same conditions and pressure which was employed in the pipes and at the burners; and the air being perfectly dry, condensation did not take place.

After a few words of commendation from several of the members and the Chairman, both papers were referred to a Committee for report.

Recent Wills.—Mr. Edward Bush, of Alveston, Gloucester, who was for fifty years a Director of the Bristol Water Company, for twenty of which he filled the position of Chairman, left estate valued at £144,813 gross, with net personalty of £118,875. Mr. Joseph Eccles, of Preston and Birkdale, a Director of the Preston Gas Company, left £88,180.

Patents of Last Year.—Some particulars with regard to the past year's working of the Patents Act and other laws affecting inventions have been published by Messrs. Hughes and Young, patent agents, of Chancery Lane. The applications were: March quarter (91 days), 7144; June quarter (91 days), 6763; September quarter (91 days), 6720; December quarter (92 days), 7939—total, 28,566. The highest number of applications made in a week in the July quarter was 501, and in the December quarter 655. The operation of the Patents Act has adversely affected the number of foreign inventors applying for patents, which show a reduction of 8½ per cent.; the present proportion being 110 in 590, or about 20 per cent. The patents relating to gas-engines figured for nearly 1100 in the total.

REGISTER OF PATENTS.

Distilling Coal to Produce Smokeless Fuel.

[Not "Coalite."]

White, W. C., of Sidcup, Kent.

No. 28,692; Dec. 31, 1907.

This invention relates to the production of a fuel, practically smokeless in burning, from bituminous coal by treatment with chemicals and subsequent partial destructive distillation, at a low temperature under diminished pressure by means of a vacuum pump, "whereby a semi-coked coal is produced."

The coal, preferably in a small state, is treated chemically by being sprayed with a solution or mixture in water of the carbonates and chlorides of sodium or potassium and calcium chloride. The mixture is used in equal proportions, so as to produce 0·1 per cent. (2·24 lbs. per ton) of such mixture in the finished product; and the treatment may take place in trucks or any suitable receptacle, either before or after introduction to the retort.

The coal, treated as above, having been introduced into the retort, heat is applied for four or six hours; the pressure within the retort being diminished "so as to distill the oils and gases at the lowest temperature possible—such temperature not exceeding 450° C. until about half the possible quantity of gas producable by the coal is liberated." Steam may be introduced into the retort at intervals during the process or at the end of the process—such introduction carrying those oils which are liberated at a temperature insufficient to distil, mechanically into the receiver.

The products given off at the gas-outlet of the retort (ammonia, tar, light oil (naphtha), and gas) are withdrawn as liberated, collected in the hydraulic main, and afterwards led to the condensers.

The process having been carried out and the exhauster stopped, the product is withdrawn and cooled by quenching with steam or water. It is said to be "chemically treated semi-coked coal, smokeless in burning, and in which the rapidity of combustion has been retarded, so that when burnt in an ordinary fire-grate a greater amount of heat is radiated into the room than with coal which has not been so treated—such retardation of the combustion making the coal burn longer, and therefore less heat escapes by the chimney than otherwise."

Extracting Hydrocyanic Acid from Waste Gases.

Percy, T. M'L., and Byrom, T. H., of Wigan.

No. 1608; Jan. 23, 1908.

In certain waste gases, the patentees point out—especially those from coking plants recovering sulphate of ammonia—considerable quantities of hydrocyanic acid gas are found, causing danger to workmen. In modern practice these waste gases are usually treated in Claus plant for the sulphur which they contain; and during this treatment much of the hydrocyanic acid is converted into ammonia. Some, however, remains, and is a great source of danger when clearing out the sulphur from Claus plant. It is recognized by the Alkali Act that this HCN is a highly dangerous gas, and that some means ought to be taken for the protection of the workmen.

It has been proposed to bring the gases from the sulphate of ammonia recovery plant through dilute sulphuric acid, then through a high-grade alcohol scrubber in which the gases and alcohol pass in the reverse direction, and afterwards distilling. The authors are not aware, however, that this has ever been carried out; and the cost of alcohol (with the waste which must naturally ensue) would make it prohibitory. It has also been previously proposed to pass gases containing, among other things, hydrocyanic acid and nitric oxide up a scrubbing tower presenting a large extent of surface down which cold water is allowed to run, so as to separate the hydrocyanic acid from the nitric oxide—the solution of hydrocyanic acid being afterwards treated with alkali to obtain cyanide.

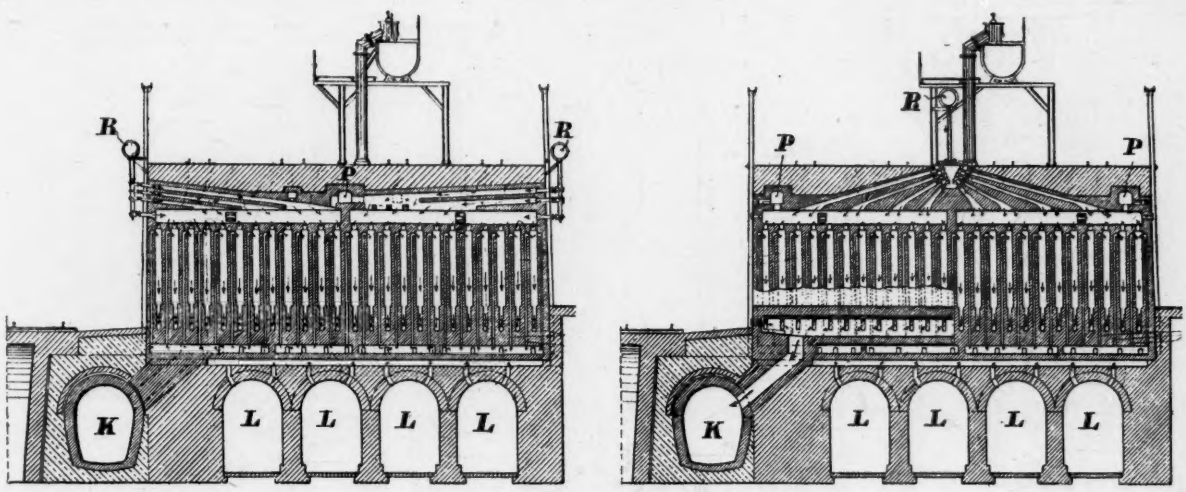
Their present invention is designed to extract this gas from the waste gases before entering the Claus plant; and for this purpose they are caused to ascend against a very slight trickle of water in a coke-tower—say, a flow of 200 to 600 cc. of water per minute passing through a tower 20 feet high and 3 feet wide—or other form of scrubber, before entering the Claus plant. In this way, the bulk of the HCN is arrested, and is found in a comparatively concentrated form in the liquor; while if the quantity of water has not been too great, very little of the sulphuretted hydrogen is absorbed in it. The resulting liquor is now well mixed with a preferably soluble lead salt in order to precipitate any sulphur. It is then heated; and the hydrocyanic acid evolved is passed into a solution of caustic soda or potash, whereby it is converted into a solution of sodium or potassium cyanide, which may be concentrated as such or evaporated to form a solid. The liquor may also be treated for the sulphocyanide it contains, or, if desirable, the cyanide can be all converted into sulphocyanide, or recovered as ferrocyanide, or as Prussian blue, or by other usual methods of recovery. Not only is the cyanide recovered, but the gases from which it is extracted are said to be in a more suitable condition for passing into the Claus plant.

Coke-Ovens for Recovery of Bye-Products.

Bauer, T. von, of Berlin.

No. 28,290; Dec. 23, 1907.

This invention relates to horizontal coke-ovens for the recovery of bye-products of the type wherein vertical flues are traversed by the gases in parallel only, and the latter are supplied thereto only from above. Horizontal coke-ovens for the recovery of bye-products wherein the gases are supplied to the vertical flues both from above and from below (in which case the vertical flues are traversed by the gases both in series and in parallel) or from below only, through passages receiving the gases from independently controlled nozzles arranged outside the



Von Bauer's Bye-Products Recovery Coke-Ovens.

oven, are well known. But the present invention relates to ovens of the first type, wherein the return gases are supplied to separate groups of flues, or to each flue separately, through a series of small passages leading from either both sides or the centre of the oven, to the upper ends of the vertical flues, and communicating respectively with independently controllable nozzles arranged outside the oven—a distributing channel being in some constructions provided between the small passages and the vertical flues. The invention also consists in providing an adjustable brick in the distributing channel for the purpose of regulating the flow of the gases, so that they may be directed as may be desirable towards the centre or more towards the sides of the oven; and in providing in the centre or at the sides of the oven one or more compensating passages receiving any excess of return gases for the purpose of regulating any over-pressure in consequence of a surplus of return gases having been introduced through the supply passages—the compensating passages communicating with all the walls of the ovens of the battery.

The illustrations show longitudinal sections through the walls of the oven into which the hot gases are introduced by nozzles and through passages from the outside of the oven, and (alternatively) from the centre of the oven.

As will be evident from the sketches, the return gases are blown into openings in the walls through tubes R, arranged along the battery of ovens and having branches for each half of the wall, into a distributing passage communicating with all the heating flues, and above the passage through several smaller passages or tubes arranged either over or next to each other either from outside the oven or from the centre.

In order to be able to regulate a possible surplus of gas (in consequence of too great a quantity being introduced through the upper passages) without need of mechanical operation, all sides of the ovens of one battery communicate by two outside gas compensating passages P, or one central compensating passage P, so that any surplus of gas will immediately pass through these channels into the walls of the neighbouring chambers and so maintain a constant gas pressure in all the chambers of one and the same battery. For the purpose of better regulating the supply of hot gases, a brick S is fitted into the distributing passages and adjustable from outside by means of a hooked rod, whereby the heating gases introduced may be directed more towards the centre or the sides of the ovens as required.

The heating gases as introduced are distributed over the heating flues, where they will meet the highly-heated combustion air coming from the passages of the brick walls separating the flues, and escape, after combustion, downwards through the bottom passage and the flue into the waste-heat passage K.

The combustion air is drawn from the foundation flues L, whence it enters passages and where it is heated by radiation from the brickwork; then it rises and is heated to a high temperature and enters into the heating flues, where it meets with the gas coming from above.

Manufacture of Gas.

HAMMOND, J., of Eastbourne, and CASH, J., of Hove.

No. 12,955; June 17, 1908.

This invention has reference to the manufacture of combustible gas by a process in which the volatile constituents of a mass of coal are driven off by heat developed by the partial combustion of a portion of it, and in which water gas is alternately produced by the passage of steam through the incandescent coke produced.

This process is so conducted that "the gases produced shall have a sufficiently high calorific value to be suitable for domestic and manufacturing purposes (like ordinary town gas), and that a large amount of ammonia shall be produced, whereby the purification of the resultant gases may be assisted and the cost reduced."

The process is described as being carried on in apparatus adapted to enable bituminous coal to be continuously supplied to it, and air to be brought into contact with the external surface of the mass of coal so that the external portion of the coal is converted into incandescent coke, which forms a jacket that retards or prevents the immediate combustion of the internal mass of coal from which the volatile constituents are being distilled, and which apparatus is adapted to enable the steam to be then caused to act on the coke for the production of water gas. The products of combustion of the coal burned in air are led away through regenerating chambers, which may be formed in the generator, separately from the combustible gases resulting from distillation and from the action of the steam on the incandescent coke, so that the combustible gases are not diluted by the products of combustion in air. The production of distillation gases and water gas (which together constitute a carburetted hydrogen gas suitable for lighting and heating purposes and of any required illuminating power and high calorific value as compared with Mond or similar producer gas) is said to be accompanied by the production of considerable quantities of ammonia and tar.

In order to ensure surface combustion of the mass of coal occurring during the blow, the walls of the generators employed are formed internally with grooves extending between the hearth or grate level and the regenerators, so as to facilitate the passage of the air and gases produced between the surface of the mass of coal and the containing walls. The coal is continuously supplied through the hearth or grate in a compressed condition.

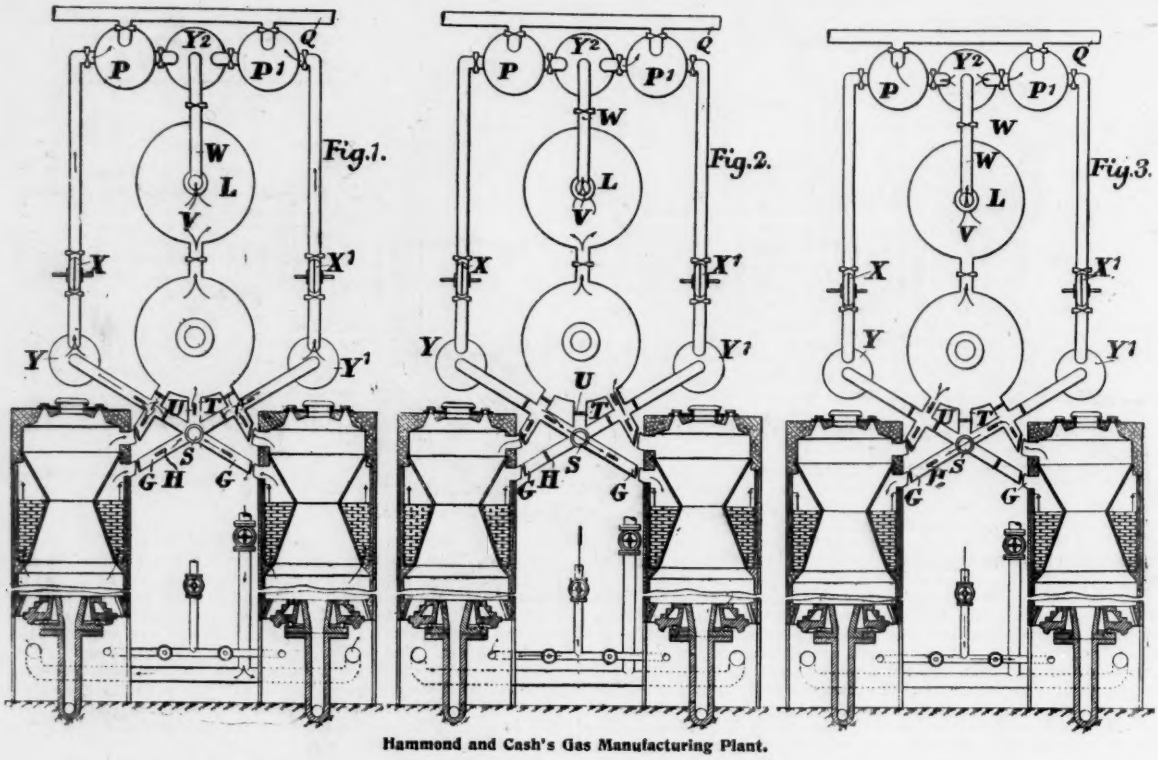
Figs. 1, 2, and 3 (p. 110) illustrate diagrammatically an example of twin generator plant (of the type shown on p. 19 of last week's "JOURNAL") for carrying out the process. In fig. 1 the valves are supposed to be set for the blow, and in figs. 2 and 3 for runs in reverse directions respectively.

The twin generator chambers are each provided with a passage G (fitted with valves), branched passages leading to the carburettor K and superheater L and connected by branches to the passages G, and by other branches to bye-pass pipes to scrubbers P P^1, and thence to the main take-off pipe Q. S is a valved stack at the junction of the passages G. T is a passage leading from the junction to the carburettor K; and U is a valve controlling it. There is a valved stack V on the superheater. W is the take-off pipe from the superheater to the scrubbers. X X^1 are exhaust fans in the bye-pass pipes; and Y Y^1 Y^2 are seal-pots. In the tops of the generators are apertures (fitted with gas-tight closures) through which the generators are fed with coal at starting or when necessary. These apertures can be fitted with pocket valves to enable feeding to be effected without the inlet of air or escape of gas. Pipes extend through the centres of the grates through which coal is, by hydraulic rams or other suitable means, forced in a compressed state through the pipes. The carburettor K may act merely as an additional fixing or superheating chamber; but further enrichment of the gas may be effected by admission of oil into it.

The generators having been charged with hot coke and compressed coal at starting and the valves set as shown in fig. 1, and the valves of the stacks S and V being open, the air blast is admitted beneath the grates of both generators, so that it passes through them and comes in contact with the outer skin of the coal in the lower part of each generator. The products of combustion pass into the regenerators, where a suitably regulated quantity of air is mixed with them to cause combustion of any gases present. Thence, by way of the passage G, they pass partly through the stack S and partly through the carburettor K, superheater L, and stack V. The volatile constituents of the coal driven off by the heat thus developed are continuously drawn away from the top of each generator by the fans, and pass through the scrubbers P P^1 to the gas-main take-off pipe—the suction of the fans being such as not to interfere with the proper flow of the products of combustion through the regenerators.

During this part of the process, the valves of the stacks S and V are adjusted so as to control the heating-up of the carburettor and superheater, which may not require to be heated to the same temperature as in water-gas manufacture by the ordinary process.

When the external portion of the coal between the grates and the regenerators has been converted into incandescent coke, and sufficient heat has been absorbed from the products of combustion by the regenerators and the carburettor and superheater, the air supply is cut off, the valves are all set as shown in fig. 2, the stack-valves are closed, and steam is admitted to the chamber at the base of the generator and passes up through the incandescent portion of the coal, producing water gas, and, passing through the mass of unburnt coal in the generator, flows into the passage G leading to the regenerator of the right-hand generator, where they receive a further supply of steam from some convenient source. The gases are delivered from this latter regenerator into the bottom part of the generator above around the incandescent coke, which forms, as it were, a jacket around the mass of coal, and then pass into and upward through the coal, with a resulting



Hammond and Cash's Gas Manufacturing Plant.

urther production of combustible gases and ammonia, and after mixing with the distillation products are led off from the top of the generator to the carburettor K, superheater L, and pipe W, to the scrubbers P P1, and thence to the gas-main take-off.

The temperature in the generators having fallen below that required, steam is cut off and the generators are again blown in parallel, as described. When they have again been brought to the proper temperature, the air supply is cut off, the valves are set as shown in fig. 3, the stack valves closed, and steam admitted to the lower chamber of the generator. The steam passes through the incandescent coke and through the mass of coal, and the resultant gases then flow into the passage G, thence to the left-hand regenerator, where further steam is added, through the coal therein, and from the top of the generator pass by the carburettor, superheater, and scrubbers to the gas take-off.

In the carrying out of the process steam is supplied in excess, and considerable quantities of ammonia and tar are said to be obtained as bye-products. Some of the ammonia may be advantageously employed as a purifying agent for removing the carbonic acid and sulphuretted hydrogen from the gas—preferably, by the process described in patent No. 8348 of 1886 granted to Mr. Hammond.

Having thus described their process, the patentees next detail "an improved construction of generator . . . convenient to employ in carrying out the process;" but it is to be understood that the process is not necessarily carried out in the way described.

Having fully referred to the arrangement depicted on p. 19 of the "JOURNAL" last week, the patentees set out their claims for invention as follows.

(1) A process for the manufacture of gas, with the production of ammonia and tar, wherein air is supplied to the outer surface of a mass of coal in such manner as to cause surface combustion thereof and destructive distillation of the internal mass by the heat thus developed.

(2) A process for the continuous manufacture of combustible gas, wherein the outer skin of a mass of coal or other fuel is converted into an incandescent coke jacket by the combustion in air of the external surface; water gas is produced by the dissociation of steam passed through the incandescent coke and coal; and the internal mass of coal or fuel is subjected to destructive distillation by the heat developed by combustion—the gases resulting from distillation and undiluted with the nitrogen of the air serving to enrich the water gas.

(3) Apparatus for carrying out the process according to claim 1, comprising a generator of the producer type provided with means whereby coal is supplied to the generator in a compressed form and air supplied to the external surface of the mass of coal in such manner as to cause surface combustion thereof.

(4) In apparatus according to claim 3, forming a portion of the internal wall of the generator with grooves or channels—for example, by means of moulded fire-bricks.

(5) Apparatus for carrying out the process according to claim 1—comprising a generator of the producer type; a pipe or passage leading from a coal-compressing apparatus to the centre of the hearth of the generator; an annular grate surrounding the mouth of the pipe or passage; means for rotating the grate for the purpose of discharging residue from the generator chamber; and means for supplying air and steam alternately to the generator chamber from beneath the grate.

(6) In apparatus for carrying out the process according to claim 1, the combination in a generator of the producer type of grooves or channels formed in the internal wall of the lower portion; a regenerator chamber above this portion; and ports or passages leading from the grooves or channels into the regenerator chamber.

(7) Apparatus for the manufacture of gas constructed and arranged substantially as described . . . whether the same be embodied in single or twin generator plant.

Air or Gas Preheating Devices for Retort-Furnaces.

M'LUSKY, W. B., of Perth.

No. 2995; Feb. 10, 1908.

This invention has for its object to provide an air or gas heating device which shall be easily accessible in all its parts and adapted to be readily incorporated in the retort-furnace "in such a manner as to be relieved of all structural stresses due to weight and in which a large air or gas heating surface is afforded in a compact form." The device comprises "one or a plurality of hollow narrow elements arranged to be heated externally by waste furnace or oven gases and constructed of refractory material or metal, and provided with inlet, outlet, and inspection openings—the air or gas to be heated passing, when more than one element is used, in parallel through the elements."

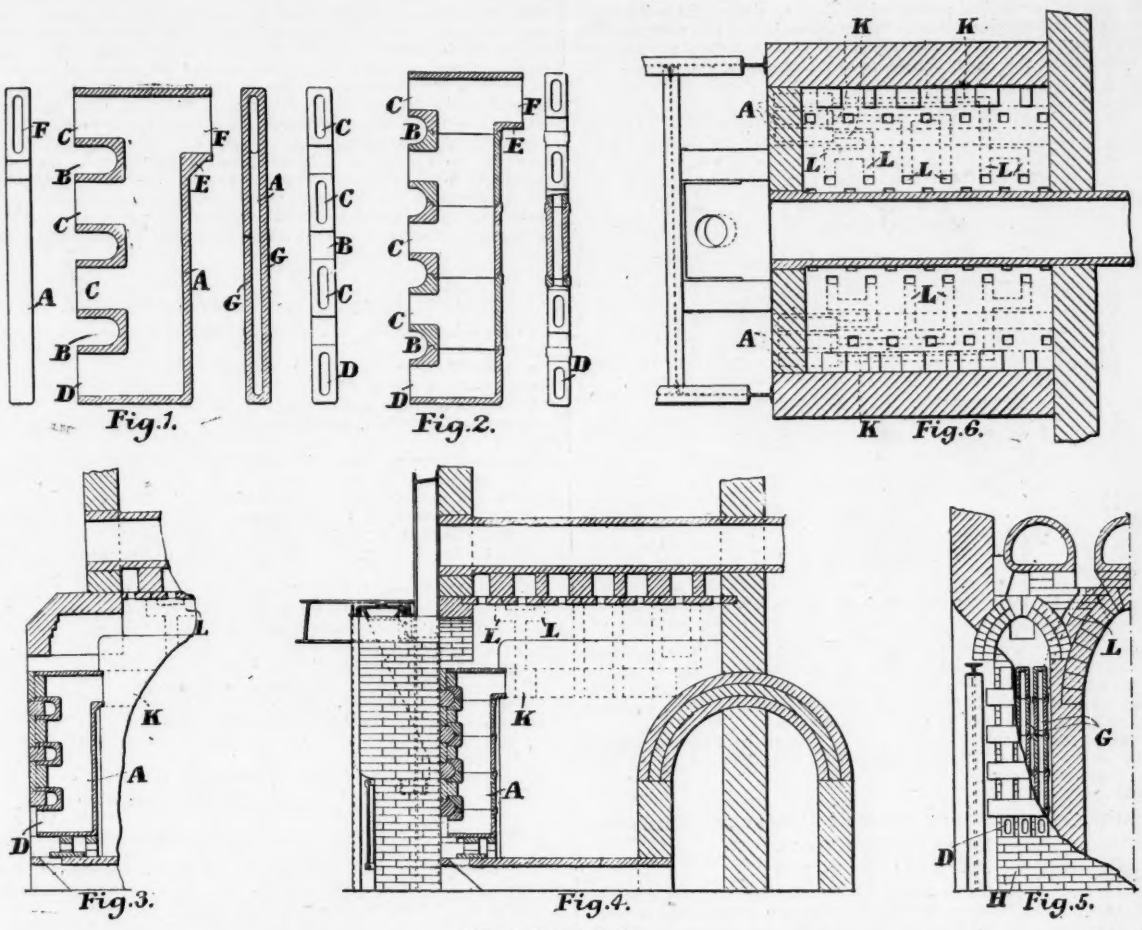
Fig. 1 (p. 111) shows sectional elevation and side views of the gas or air heating device. Fig. 2 is a modification in which the device is built up of separate pieces. Fig. 3 is a part sectional side view showing the device applied to a retort-setting, the lower part of which projects beyond the face of the main setting. Fig. 4 is a part sectional side view showing the device applied to a setting flush with the main setting. Fig. 5 is a part sectional front elevation of fig. 4. Fig. 6 is a plan showing two sets of the heating devices in position.

According to one construction (fig. 1), narrow hollow vertical elements A, constructed of refractory material or metal, are employed. They are relatively long as compared with their breadth, are formed with their walls as thin as possible, consistent with the requisite strength, and are adapted to stand upright—that is, with their longest sides vertical. They are dented in for a considerable portion of their width—say, for instance, at three points, as at B. The portions of the side between the indentations form openings C D, the lowermost of which acts as an inlet for the air or gas to be heated, while the other three openings above act as inspection holes. Upon the opposite vertical side, and at its upper end, is a projecting portion E, having a passage F through it. The dented-in parts B are arranged so as to afford supporting means between the two flat wide vertical sides G.

In fig. 2, the hollow elements are constructed of a number of parts fitting together with a spigot and socket arrangement. This form is particularly applicable when fire-clay is employed, as it enables the moulding and "firing" of the clay elements to be effected with greater ease. Fig. 2 also illustrates the employment of five instead of four inspection openings.

In applying the device as described to a gas-fired retort-furnace, one or a plurality of the hollow elements A are arranged vertically in the flue or duct conveying the waste gases from the furnace to the chimney. They are arranged with their broad sides G adjacent to one another, and with the inspection and inlet apertures C D adjacent to one of the side walls H of the furnace or other structure. They are built into this wall in such a way that the inlet and inspection openings are readily accessible from the outside. The incorporation of the aperture side of the elements with the side wall of the furnace structure is so effected that the elements are free from all stresses due to the superimposed weight of the rest of the structure—it being merely necessary to form a relatively air-tight connection around the sides G adjacent to the furnace wall.

The air or gas to be heated is passed into the inside of each tube through its lowest inspection aperture D, and escapes by the aperture F, near the top on the side opposite to the inspection apertures. The air or gas on leaving this outlet passes into a separate duct or channel K, in the solid wall of the furnace between the gas-producer and the main pier of the arch (when a gas-producer is used), and thence, by channels L, spaced off in the packing of the producer arch N, direct



M'Lusky's Retort-Furnace.

to the combustion chamber, where it meets the gases issuing from the producer.

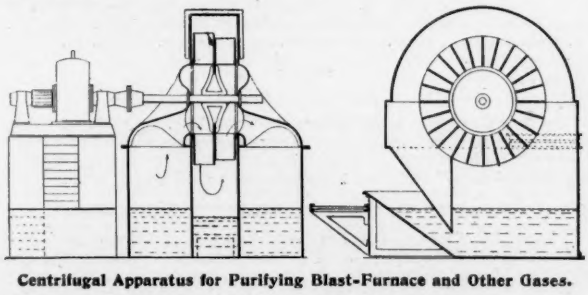
It is claimed that a great advantage of the arrangement described is its accessibility—any and every part of the elements being accessible from the front for inspection or repair without interrupting the working of the furnace; also that short-circuiting or cross cutting "is effectually overcome, and the predetermined quantity of air admitted at the inlet of each tube is delivered at the combustion chamber with absolute certainty."

Purification of Blast-Furnace and Other Gases.

DUDGEON, A. J.; a communication from the Société Anonyme John Cockerill, of Seraing, Belgium.

No. 13,563; June 25, 1908.

The invention relates to centrifugal gas-purifiers of the kind in which a fan or blower is employed having a rotor divided into two portions by a partition and mounted in a casing so that the gas drawn in axially and discharged at the circumference of the first portion of the rotor is caused to pass through the second portion of the rotor in the opposite direction. The object is to provide apparatus which shall be capable of dealing with large volumes of gas with the expenditure of little power, and of efficiently cleansing the gas without liability to choke and without the necessity for spraying water into the rotating member of the fan.



Centrifugal Apparatus for Purifying Blast-Furnace and Other Gases.

The portion of the fan-wheel on the intake side of the partition is made of larger diameter than that on the delivery side; and the divided fan-wheel is mounted in a casing of considerably larger diameter than the fan-wheel. The pipe leading the gases from the generator to the motor in which they are to be consumed is entirely closed round its periphery, and has only two lateral orifices—one on each side. It terminates below in a scuttle-like cavity or in a water seal. The wheel is divided into two symmetrical portions by a diaphragm or disc, the portion on the intake side being of larger diameter than that on the discharge side (as explained).

The gases drawn in by the portion of the wheel on the intake side are projected towards the periphery of the casing, and can only escape by passing through the second portion of the wheel at the delivery side in the opposite direction—*i.e.*, from the circumference towards the centre. Thus, by making the portion on the intake side of larger diameter, the reduction which would otherwise occur in the velocity of the gas at the discharge is obviated, and a positive difference of pressure is produced at the discharge from the first portion of the wheel. This facilitates the passing of the gases into the second portion and their delivery from the discharge outlet.

The solid particles or liquids carried by the gas are projected through the relatively large space left at the circumference of the wheel against the inner wall of the casing, owing to their greater density, and fall into the bottom of the casing. The separating action of the apparatus may be assisted, if desired, by injecting water at the periphery of the casing. If it is employed, it is not subjected to the centrifugal action with the gas, but remains in the form of a sheet or film on the inside of the casing and serves to retain the dust or to condense the liquids contained in the gas to be purified.

The illustration shows the apparatus in longitudinal and cross section.

Controlling from a Distance the Passage of Gas.

AUBERT, A. M. & J. M., of Bilancourte, France.

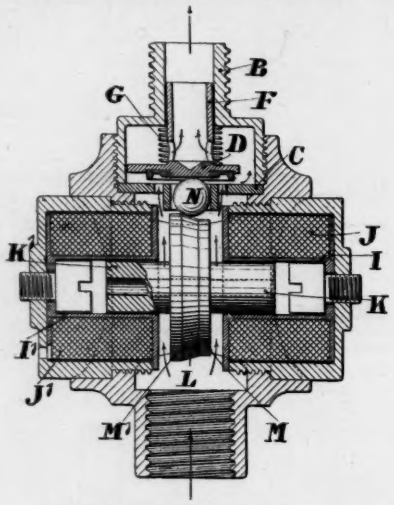
No. 15,861; July 25, 1908.

This distance gas-controller is operated by three electric leads; the device comprising two electro-magnets (thrown into circuit alternately by turning a switch), one determining the admission of gas to the burner and the other the cutting off of the supply. The valve designed to open a passage for the gas is so arranged that against its rear face can bear a ball resting on a transverse inclined plane or on a cam in such a manner that lateral displacement of the plane or cam in the one direction lifts the valve, and in the opposite direction lets the valve return to its seat under the action of a spring.

As shown (p. 112), the upper casing has screwed into it a tube B, which holds in place the seat C of the valve D, guided by a tubular extension F and held on its seat by a spring G. Into each side of the casing is screwed a cap containing a bobbin I I^1 of a solenoid J J^1; and within the hollow bobbin slides the solenoid core K K^1. The two cores are fixed to the opposite faces of a disc L, having a central conical portion and two cylindrical portions M M^1 of different radius on its periphery. Accordingly as current is transmitted through J or J^1, the disc is moved to the right or to the left.

Extending co-axially through the seat of the valve is a short tube in which is lodged a ball N resting on the disc L. The diameter of the ball is such that when it rests on the cylindrical portion M of the disc the valve D can rest upon its seat, but when it rests upon the cylindrical portion M^1 of the disc the valve is fully opened, while when the

ball rests on the conical portion of the disc, as shown, the valve occupies an intermediate position. When the solenoid J is energized the valve is lifted, while when the solenoid J^1 is energized the valve is able to return to its seat under the action of the spring G.



Aubert's Distance Lamp Controller.

A simple switch, having two poles, suffices to control this valve from a distance. When the valve is open, the gas passes through by way of the orifices in the valve-seat and those in the tubular extension F; and inasmuch as the ball N has considerable play in the tube, gas also passes through this tube, as shown by the arrows.

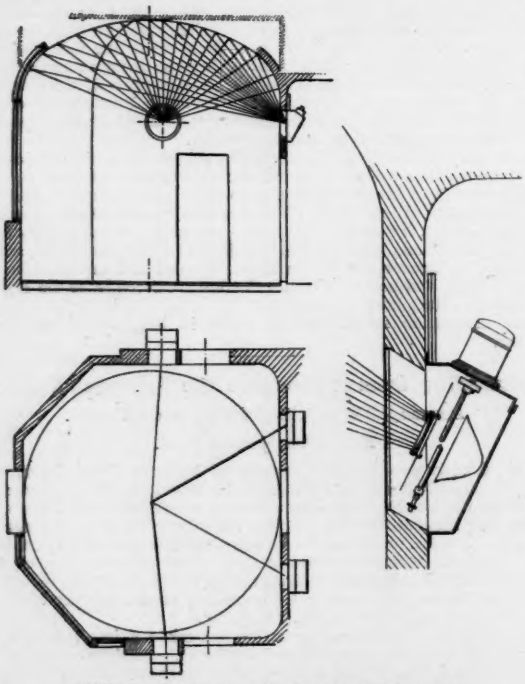
The gas passing to the burner may be kindled by platinum sponge or the like, or by a platinum wire heated to incandescence by the passage of electric current.

Illuminating Interiors without Producing Shadows.

LUITHLEN, F., of Vienna.

No. 18,508; Sept. 3, 1908.

This invention relates to means for illuminating interiors (such as hospital operating theatres, studios, and the like) without the production of shadows. It has been attempted to arrange the source of light outside of the room to be lit; but so far (as the patentee contends) no shadowless light has been obtained. Moreover, with such arrangements there was the disadvantage that the greatest part of the rays of light flowed direct into the room and part also direct into the eyes of the operator—an obvious defect.



Luithlen's Arrangement for Illuminating Interiors.

In the illustration, an elevation and plan of a room with the improved illuminating means are given, and one of the sources of light proposed. Any desired source of light of suitable power can, of course, be used.

As shown, at the desired places are arranged, behind interruptions in the walls or fitting in suitable recesses formed in the walls, the sources of light, so that the whole of the rays from the latter are projected towards the ceiling of the room, which reflects these as diffused rays of light. The interruptions in the walls screening the source of light are closed off by glass from the room to be illuminated. Preferably reflectors are used to increase the illuminating effect and assist in cutting off the laterally or downwardly directed rays of light. For the same purpose lenses are mounted in front of the source of light, so as to increase the luminous circles on the ceiling and cause them to coincide with one another. The lenses at the same time prevent the grouping of the light rays into beams, since they distribute the rays of light uniformly over the ceiling. Although this indirect shadowless illumination of rooms is of special value for operating theatres, it can be used for the illumination of interiors for any desired purpose. In particular, the circumstance that with this mode of illumination the illuminating body is mounted in a place outside of, or excluded from, the room to be illuminated allows of its use where explosives are to be handled.

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28,128.—EVANS, W. E., "Measuring instruments." A communication from A. Freschl. Dec. 24.

28,134.—BLAND, C. W., "Supporting rings of inverted mantles." Dec. 24.

28,151.—HUMPHREY, A. A., "Raising liquids by compressed gases." Dec. 24.

28,201.—DEMPSTER, R., AND SONS, LTD., and TOOGOOD, H. J., "Vertical retorts." Dec. 28.

28,202.—DEMPSTER, R., AND SONS, LTD., and BROADHEAD, J. W., "Measuring device for coal, coke, and other substances." Dec. 28.

28,207.—MILBOURNE, R. J., "Valvular arrangements for controlling and directing or reversing the passage of gas." Dec. 28.

28,233.—FARNHAM, R. V., "Gas scrubbers or purifiers." Dec. 28.

28,349.—RINDOM, A. J. P., "Gas-retorts." Dec. 29.

28,358.—CUTLER, E. E., "Guide-carriage for gasholders." Dec. 29.

28,396.—SHARP, W., "Gas-regulating nipple." Dec. 30.

28,435.—LAIGLE, R., "Incandescent gas and electric filaments." Dec. 30.

28,440.—HUTCHINS, T. W. S., "Gas-producers." Dec. 30.

28,462.—NEILSON, W. C., "Purification and recovery of tar and other substances from blast-furnace, producer, and like gases." Dec. 31.

28,560.—STILL, E. H., "Incandescent gas-lamps." Dec. 31.

RESTORATION OF LAPSED PATENT.

Notice is given that an order was made on Dec. 31, 1908, restoring the letters patent granted to JOHN FREDERICK SIMMANCE for an invention for "Improvements in apparatus for the lighting and extinguishing of gas-flames," No. 8055 of 1900, bearing date May 1, 1900.

Loan for Water-Works Purchase Refused at Crewkerne.—The proposal of the Crewkerne Urban District Council to purchase the undertaking of the Crewkerne Water Company has met with unexpected opposition. After prolonged negotiation, the Council and the Company came to terms in December, 1907, on the basis that the Council should take over the works as a going concern for the sum of £14,500, *plus* the reserve capital of £983. Application was made to the Local Government Board for sanction to a loan of £15,500 to carry out the bargain, and the usual inquiry was held. Last Tuesday, the Council received a letter from the Board declining to sanction the loan, on the ground that it was excessive. It was decided to send a copy of the letter to the Water Company.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Messina Disaster—An Appeal for Help.

DEAR COLLEAGUE,—The great misfortune which has befallen our nation makes us think of our colleagues employed at the gas-works in those provinces, some of whom have perished, and many of whom are wounded, and require not only our co-operation but also the knowledge that we are not behindband in hastening, in the moment of need, to show our solidarity and affection. An appeal addressed to the managements of the Italian gas-works asking each of them to send, at their own expense, workmen to the scene of the disaster, shows the great fraternal feeling which exists in our industry.

Under the auspices of the President of our Association, consisting of the gas officials of Italy, the magazine "Il Gaz"—the official organ of the Association—has opened a subscription list for the members of the Society, as well as for employees and workmen, for our unfortunate colleagues in the provinces so terribly afflicted. The readiness with which they have responded to the appeal induces us to turn to your country; and we shall be grateful if you, dear colleague, will help in such a work of fraternal charity by supporting our appeal, and placing your important publication at our disposal for the acknowledgment of the donations received.

Thanking you in advance, and hoping for a reply relative to this subject,

We remain, yours faithfully,
Cap. VITTORIO CALZAVARA, Editor of "Il Gaz."
For the Italian Gas Association,
LUIGI VALSECCHI, President.
FEDERICO LAENG, Secretary.

Venice, Jan. 2, 1909.

[We shall be only too pleased to receive and acknowledge contributions in response to the above appeal. They shall be duly forwarded to Signor Calzavara.—ED.J.G.L.]

The Livesey Memorial Fund.

SIR,—Mr. Carpenter sums the position up very pithily. There is no longer any question open of "What form?" but simply "How much?"

I have to answer this last question in several places, and have set myself to the question of ratio between total sum wanted (£10,000) and the "probable possible" sources of the funds.

While far from discouraging those whose zeal dictates more generous methods, one must beware of the effect of extra large donations upon the feebler folk, who may think the money will be almost too easily found without their due contribution.

I find the total sale of gas by all English, Scotch, Welsh, and Irish gas undertakings to be 194,000 millions for 1907. Eliminating the municipal undertakings (which may be debarred) leaves 124,000 millions. And if all these subscribed 1s. 7d. per million, it would bring in the amount wanted.

But there may be abstentions, and those who will not follow any method beyond a round sum. On the other hand, there will be private and professional donors outside the "company" zone. So it might be taken as a guide at 2s. per million cubic feet—£1 for 10 millions.

This gives a probable adequate contribution; and though some have already generously given beyond this, I think those who, like myself, may be asked to advise, will find this a reasonable, logical, and effective scale.

Palace Chambers, Westminster, S.W., Jan. 8, 1909. HY. E. JONES.

Fire Insurance Companies as Electric Light Canvassers.

SIR,—I am wondering if you can use your powerful influence to induce the Fire Insurance Companies to stop pressing people to instal the electric light. In the districts of the gas-works under my care, we have recently lost several valuable consumers through this. At the present moment, the Liverpool and London Insurance Company are pressing the proprietors of a large mill to put in the electric light, and the inspector who recently came over to interview them stated that all the best mills now used this light. If any of your readers are in a position to refute this statement, it would help me to retain the business. As the millowners are by far the largest consumers in the district, losing them would mean a considerable loss to the Gas Company.

Jan. 6, 1909. T. B.

A Suggested Warning to Gas Shareholders.

SIR,—I am enclosing herewith a copy of a letter which is being sent to the shareholders and stockholders, by (or with the approval of) the directors of certain gas companies, with the object of warning them against some of the dubious promotions which are being so freely brought to the notice of investors generally, and gas investors in particular.

I venture to think that a letter in these, or similar, terms should be sent by all gas and water companies to their shareholders. I may say that the letter was approved by a member of the Bar of high standing.

Jan. 7, 1909. SECRETARY.

[ENCLOSURE.]

Dear Sir (or Madam),

The directors think it right to warn you against subscribing capital for certain new companies (usually "Limited") that are being promoted from time to time, with the object of supplying gas, &c., to some of the villages and smaller towns in the rural districts of the country.

The prospectuses of these ventures are being sent broadcast among investors, and particularly to shareholders in existing dividend-paying gas and water companies.

Before subscribing to any company answering the description given, you are advised to make careful inquiries from independent persons connected with the gas industry.

Some of the companies referred to are probably *bond fide* concerns; but others are purely speculative.—I am, &c.,

Secretary.

A Pulsometer for Coke Quenching.

SIR,—Mr. M'Geachin deserves credit for saving 7s. a day in water, labour, steam, or whatever contributes to make up the amount; for the Pulsometer Company's information does not mention that the water at 4d. per 1000 gallons is pumped over and over again, or that the water is obtained from the brook flowing past the works. It may be interesting to the Pulsometer Company to learn that this "new method of coke-spraying" had been anticipated. I designed and erected a pulsometer coke-spraying arrangement very many years ago.

There were six stalls, each (say) 9 or 10 feet long by 5 feet wide, and each having a pit underneath, about the same size and 4 or 5 feet deep, into which the breeze gravitated through the flooring, which was of battens, shod with iron bars for horses' shoes to grip on. Steel plate flat rails, 12 inches broad, accommodated the wheels of the bogies. The stalls were separated from each other by strong partitions framed in horizontal 2-inch boards, bound by old railway steel rails on each side. The rails extended overhead about 8 feet horizontally, curved at the ends, and carried the 12-inch water-main, into the broadside of which near the entering end were screwed a 2-inch full-way cock to each stall. The lever was back-weighted, and had a long pendulous iron rod with a loop on the lower end for opening. The loop could be placed on a pin driven into the partition end until the quenching was sufficiently advanced. It was then let go, when the valve closed.

Each bogie contained the whole coke from the retorts in an entire oven; and the weight of coke and shale refuse dealt with per day would probably amount to 1200 tons. The water passed down through the breeze in the pits, was clarified, and returned to a large open circular brick tank, about 15 feet diameter and 20 feet deep, which in days gone by had been a mixing and stirring tank for forming milk of lime for the purifiers. A 4-inch pulsometer did the work of circulating the water from the tank to the stalls.

The bogies were drawn into the stalls by horses; and writing from impression rather than by dates, the arrangement was in use without the slightest hitch for ten or twelve years at the Tradeston Gas-Works at Glasgow, prior to the reconstruction about 1890. WILLIAM KEY.

St. Cyr, Ceres, Cupar Fife, Jan. 6, 1909.

The Tokyo (Japan) Gas-Works.

SIR,—In the description of the Tokyo Gas-Works, by Mr. Maurice Graham, in your last week's issue, there is an inaccuracy in the description of the new gas-works at Fukagawa. On p. 33 it is stated that all the work for the new inclined retort-house, except the retort-house and chimney, was supplied by us. Please note, however, that the steel retort-house complete (as shown in Photographs Nos. 168 and 169) was supplied by us in addition to the other apparatus—the whole of the work being constructed at our works in Manchester.

WEST'S GAS IMPROVEMENT CO., LTD.,
F. J. WEST, Manager and Secretary.

Manchester, Jan. 9, 1909.

Petrol-Air Gas.

SIR,—As I am desirous of being helpful in giving information I possess on the subject of petrol-air gas, so that the days of dubiety may soon pass away and confidence in petrol-air gas supplies be thoroughly established, may I ask you to insert this letter in the "JOURNAL."

The constant composition of the gas has now been assured by the invention of the Multi-chamber "Centenary" turbine gas-generator. The storage of petrol-air gas was first applied to the ordinary holder of gas-works by myself over three years ago; and the passing of the gas through an ordinary gas station-meter and governor during this period shows that with large or small installations the supply of the gas can be stored and governed similar to any other form of gas supply.

No great and important invention, whether of machinery or a new industry, has, in its first conception, blossomed out into harmonious completion without passing through processes of disappointments, losses, alterations, and improvement. Coal gas, when first produced by Murdoch for lighting, was passed directly to the burners without any condensation or purification. Both coal gas and water gas contain impurities and inherent dangerous qualities, and will always retain their power to kill by inhalation or by explosion.

My own experience was a costly one, having lost several hundreds of pounds through having to abandon, after spending a large sum on repairs, the producer plant I bought, and then threw it on to the scrap heap, replacing it with my own invention, which can be guaranteed for fifteen years, though it will probably last a life-time. This turbine multi-chambered gas-generator was erected in February, 1908, capable of producing 2500 cubic feet of petrol-air gas per hour of even quality. The apparatus during all this time has not had a single thing done to it. The sealing liquid is the same. When the valves are closed, it is a hermetically sealed vessel. The shaft packing gland has not even been touched; and that this condition will remain throughout the year now begun, I have not the slightest doubt. Anyone is welcome to come and see it. Instead of an ordinary coal-gas works, the place is now like a well-kept dairy, and as odourless.

Throughout the village during the three years it has been supplied with petrol-air gas, nothing has occurred in any way differing from a coal-gas supply; nor has there ever been any odour from the gas by the present generator during its combustion within apartments lighted by

it, nor a smell of petrol within the generating chambers, in the works, or anywhere else. There are 5 miles of pipes leading from the works in several directions. My residence is supplied with the petrol-air gas; there being 45 burners—not the whole lit simultaneously, but often nearly so. I consume 150,000 cubic feet of the gas every year; and the atmosphere of every apartment at all times is perfectly sweet and odourless. I give this general invitation to your representatives and to anyone who is interested to make a surprise visit while the lights are in use, on any night throughout the year, and stipulate only that such visitor will communicate the result of his examination to the "JOURNAL" immediately thereafter.

I would never think of employing 2 per cent. petrol-air gas, nor is it possible to do so, though it could be said that 1 gallon of petrol to 1050 cubic feet of air was 0·0159 per cent. of the whole by volume, though really 7·89 per cent. by weight. For a practical, serviceable light, 8 to 10 per cent. or more is nearer the proper proportion of petrol vapour in atmospheric air to form petrol-air gas.

Suicide through inhalation of petrol-air gas can never be accomplished. Petrol gas discourages suicidal mania, and can be inhaled freely without discomfort. Until evidence be brought forward to disprove it, I suggest that the continuance of inhalation of petrol-air gas brings with it an exhilaration; despondency disappears; buoyant hopefulness returns; and with the new light thus obtained, comes a decision to face all the difficulties and have another try.

Petrol-air gas is not intended for competition with coal gas, but to fill the position it is well able to do in supplying in a safe manner, for villages, factories, rural lighting areas, mansions, and castles, a brilliant and wholesome light at a very moderate cost. Gas plants for these do not require to have enormous gasholders capable of containing a whole day's supply. The generator should be of ample size to produce the maximum hourly requirement, and something over; the holder to work in conjunction with the generator being only of sufficient weight when falling or rising to automatically move the striking gear into such position as to take the driving belt from the loose to the fast pulley or the reverse, and at the same time maintain the pressure required over the whole area of supply. To accomplish this with the greatest ease, it is necessary that the generator should do all these functions within one vessel, and take in its own air supply by being its own exhauster as well as blower, and deliver the gas at any pressure. It is quite unnecessary that the air supply to a generator be drawn from the same apartment as a hot-air engine or a steam-engine be working in. I prefer to draw it from the outer atmosphere.

Owing to the discovery that petrol has a most complex and unequal composition, and cannot all vaporize at ordinary average temperatures of the British Islands of (say) 50° or 55° Fahr., it is absolutely necessary that a successful petrol-air gas-generator should have a considerable number of generating chambers in each vessel, and all of them at different positions in the process of the manufacture, by a number of them (being in various stages of their chambers) air filling, others at different stages of vaporizing and compression, the remainder in different stages of discharging the gas and sending it forward to the gasholder, and from it to the house supply pipes, or to underground mains and services. By such means only can successful uniform quality of petrol-air gas be guaranteed. Such an apparatus must be a workmanlike and businesslike practical generator, of great strength in design and fit to be guaranteed to stand daily wear and tear for fifteen years without breakdown. Built on such simple lines it could be formed so small as produce 100 cubic feet of gas per hour, or take in all the intermediate sizes between those of 1000 cubic feet, 10,000 feet, or 50,000 feet production of gas per hour, and using larger proportions, and each requiring small space, including a store for petrol.

From what I have said as to the constituency of petrol, it will be at once seen that it is quite impossible to entirely vaporize petrol in closed vessels and leave no residue at ordinary temperatures of our climate. During the present cold weather, the "Centenary" plant is producing 1000 cubic feet of the gas per gallon; and there remains the residue. During warmer weather 1400 feet are produced from a gallon. These volumes are registered by the station meter at the gas-works, which has 4-inch connections, and has been found capable of passing 2500 cubic feet per hour. Having recently obtained the assistance of an analyst, I have devoted much time to the investigation of the boiling points of the various constituents of petrol and of the calorific value of petrol-air gas. The following table of results will not only show the great range of its compounds of carbon and hydrogen, all having their own boiling point, but also the ridiculousness of anyone saying that he can supply petrol-air gas with a 2 per cent. petrol saturation. The sample of petrol subjected to fractional distillation was of ·720 specific gravity, with the following result.

Boiling Between.	Volume Evaporated.	Boiling Point.
50° and 70° C.	82 Cubic centimetres	Hexanes 68°—69°
70° ,, 85° ,,	68 ,, ,,	Heptanes 99°
85° ,, 97° ,,	53 ,, ,,	
97° ,, 112° ,,	53 ,, ,,	
112° ,, 124° ,,	25 ,, ,,	Octanes 125°
124° ,, 138° ,,	13 ,, ,,	
140° dark residue	7 ,, ,,	

In the above test, 250 cubic centimetres were taken from the sample. The percentage of petrol vapour in the air and gas mixture easily reaches 13 per cent. at a temperature of 10° C. (= 50° Fahr.), and could with the "Centenary" generator easily be maintained at this.

Another experiment gave a 15 per cent. mixture of air and petrol vapour at 16° C. (= 61° Fahr.). The experiments were carried out in moist air at under ordinary practical continuous working conditions, showing water again to be present in the air to the extent of 1·2 per cent. The calorific value test of petrol-air gas was made while the meter indicated a yield of 1500 cubic feet of the gas per gallon, without taking into consideration the residue, which could not be properly drawn off until the following morning—quite impossible owing to my having to be elsewhere. 158,400 British thermal units were obtained at a temperature of the gas generation of 45° Fahr., the residue not being ascertained.

Being an entirely new subject for investigation, we are naturally at present working only on its fringe.

Enough has been said to show the practical side of petrol-air gas generation, and how very small a station would be required in which to place (say) five "Centenary" air-gas turbine generators, each capable of producing 50,000 cubic feet of gas per hour; that while superintendence by only one man, another attending to stoking the steam-boiler, would be all that was necessary; and the premises would have that clean and odourless condition—whitewashed, if you like—as I have said is best likened to a spotlessly clean and well-kept dairy.

How does an ordinary coal-gas and water-gas manufacturing station compare with it? They need an enormous amount of ground for coal and coke stores, wharves and railway sidings, retort-houses and generating sheds, charging apparatus, condensers, exhausters, and purifying plant, and storage for spent lime—the whole being accompanied by the pollution of the atmosphere and ever-increasing complaints of a nuisance. Have manufacturers of petrol-air gas ever made "extravagant" claims regarding its purity, notwithstanding all that has been admitted and could be said against coal gas and water gas, and their inherent possibilities for the destruction of life and property? Very little is said or written on the subject; and particularly note that the manufacturers of petrol-air gas have never come down to that level of mud throwing, the reading of which was really the reason for taking up my pen—not to decry coal gas, but merely in defence of petrol-air gas manufacturers. So long as a reasonable regard is paid to the prevention of these possible dangers with coal gas nothing happens. Then all I ask is that a similar treatment be given to petrol-air gas, which has by this earliest application of it to the supply of villages through ordinary gas-works holders, street mains, and services in all weathers—even during a period of 27° of frost—proved itself to be a practical lighting medium, with the minimum of labour and expense, leaving the atmosphere of a room purer than is possible with coal gas. Coal gas takes its air supply from the room. Petrol-air gas brings all it needs along with it, and, unlike coal gas, does not discolour ceilings, wallpapers, and hangings, or destroy book-bindings. It creates no public nuisance; and it leaves the inmates of a house in the best of health, as also all the plants—some have been in a room where the most petrol-air gas is consumed during all the three years it has been used, and are more healthy looking than ever.

Gas-Works, Ceres, Fifeshire, Jan. 9, 1909. WILLIAM KEY.

PARLIAMENTARY INTELLIGENCE.

PROPOSED EXPENDITURE ON GAS AND WATER WORKS.

According to the plans and estimates deposited in the Private Bill Office, under the Standing Orders, on behalf of the various gas and water undertakings promoting Bills in the forthcoming session, the following expenditure on extensions of works is proposed under the powers sought. The names in parentheses are those of the engineers connected with these schemes.

UNDERTAKING.	TOTAL.
Aldershot Gas and Water Company, for water (Messrs. J. Taylor, Sons, and Santo Crimp)	£54,000
Alliance and Dublin Gas Company (Mr. W. F. Cotton, jun.)	15,000
Bungay Water Company (Mr. G. H. Perryn)	11,794
Cardiff Corporation, for water (Mr. C. H. Priestley)	272,000
Derwent Valley Water Board (Mr. E. Sandeman)	38,898
Donington Water Company (Mr. J. Portsmouth)	4,855
Edinburgh and District Water (Mr. W. A. Tait)	22,500
Exmouth Urban District Council, for water (Messrs. G. H. Hill and Sons)	43,000
Fakenham Water Company (Mr. G. H. Perryn)	5,670
Frimley and Farnborough District Water Company (Mr. R. Nunn)	24,756
Glamorgan Water Board (Messrs. Middleton, Hunter, and Duff)	80,760
Grantham Water Company (Mr. W. Matthews)	20,000
Heywood Corporation, for gas (Mr. W. Whatmough)	10,000
Llanelly Urban District Council, for water (Messrs. T. & C. Hawksley)	21,100
Northallerton Urban District Council, for water (Mr. A. M. Fowler)	14,040
Oldham Corporation, for water, £130,000; for gas (Mr. T. Duxbury), £200,000	330,000
Pontypool Gas and Water Company (Messrs. T. & C. Hawksley)	54,200
Pontypridd Water Company (Messrs. G. H. Hill and Sons)	35,329
Risca Urban District Council, for water (Mr. Baldwin Latham)	8,500
St. Andrew's Water (Mr. J. Watson)	26,050
Salford Corporation, for gas (Mr. W. W. Woodward)	250,000
South Lincolnshire Water Company (Mr. J. Portsmouth)	7,709
South Staffordshire Water Company (Mr. H. Ashton Hill)	105,050
Stourbridge and District Water Board (Mr. W. Fiddian)	10,800
Wakefield Corporation, for water (Mr. H. Rofe)	162,539
Watford Corporation, for water	90,100
Wemyss and District Water Board (Messrs. J. & A. Leslie and Reid)	221,000
Western District of Haddington Water Board (Mr. W. Allan Carter)	25,025
Worksop Water Company (Mr. E. M. Eaton)	14,300

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1908;" and, as on similar occasions, we extract from it the portions which chiefly interest our readers.

As in previous years, Messrs. Bradbury and Hirsch make a few observations upon trade and manufacturing in general, and upon the fertilizer trade in particular, before entering upon their review of the sulphate of ammonia and nitrate of soda markets. They say that, without question, the year 1908 was, commercially and industrially, one of the worst on record in recent years. The financial breakdown in the United States, referred to twelve months ago, was the occasion, but not the cause, of the commercial and industrial upset there. They think it would be more correct to say that it was the result of wildly inflated trading and the natural and necessary effect of it. The year was entered upon with inflated stocks and prices; but confidence in the continuity of the "boom" was gone, and the intervening time has been occupied in adjusting supply to actual demand. All have been engaged in cutting down to "hand-to-mouth," and they have used the pruning-knife vigorously. Probably the year has gone far in the way of working out the salvation of trade and industry—in some cases the working-down process may have been overdone—and it is thought that 1909 will commence fairly.

There may seem to be no immediate connection between trade in general and the fertilizer trade, and yet depression has overtaken it. The explanation is that the same cause has brought about the same effects, and the cause has been over-production of the leading lines—phosphate rock, nitrate of soda, and superphosphates. The result has been seen in keener competition for orders, and in the lowering of prices all round. The reviewers cannot say, therefore, that the prospects for the coming season are very bright. Atmospheric nitrogen in the shape of nitrogen compounds does not make rapid progress as a fertilizer; and though it is being distributed, it is not in large quantities, and it has not had any appreciable effect upon the market for nitrogenous material.

With regard to nitrate of soda, Messrs. Bradbury and Hirsch remark that the situation at the end of 1907 was such as to render any accurate estimate of the supply for January-April practically impossible. They thought then that the supply for Europe for the ensuing four months might be somewhere about 841,000 tons. As a matter of fact, it proved to be 894,000 tons—viz., delivered from the ports, 804,000 tons; stocks carried forward into May, 90,000 tons. The deliveries in the two immediately preceding years were 727,000 tons and 723,000 tons. All through January the market was slow; but the opening price—11s. 1½d. per cwt.—was maintained. Sellers made the most of the labour troubles on the west coast; and in February, there being good Continental demand, there was an advance to 11s. 3d. per cwt., though 1½d. of the advance was lost near the close owing to advices of exceptionally heavy shipments being got away. The demand in March was still more satisfactory; but sellers everywhere had become anxious to reduce their holdings, and the price dropped to 10s. 10½d. per cwt. Deliveries in April were only on about the same scale as those in April, 1907, and the price fell to 10s. 6d. per cwt.; and although deliveries in May and June showed an increase of 16,000 tons upon those for May-June, 1907, the price dropped to 9s. 9d. per cwt.—the lowest recorded since 1904. There was a recovery to 10s. per cwt. in July; and this price was maintained up to September, when there was a decline to 9s. 7½d. After that, the price fluctuated between 9s. 6d. and 9s. 7½d. until the second half of December, when, the loadings advised being very heavy, the market settled down to 9s. 6d., with 2½ per cent. discount, *ex* store at Liverpool, for ordinary quality.

As the prices free alongside on the west coast may serve as a sort of barometer of opinion among producers as the year progressed, Messrs. Bradbury and Hirsch give them. From 8s. 3d. per quintal at the outset there was an advance to 8s. 6½d. in January. Early in February there was a drop to 8s. 2½d.; and, later, 8s. 1½d. per quintal became the price. March saw a fall to 7s. 8d.; but there was a recovery to 7s. 10d. In April there was a decline to 7s. 7d., and in May the price became 7s. 4½d.; but there was a recovery to 7s. 7d. In June the price fluctuated a good deal—as low as 7s. 0½d. per quintal being reported; but the closing figure was 7s. 3½d. In July and August the quotations were fairly steady at 7s. 4½d. to 7s. 6d.; but in September as low as 7s. 2d. was marked. There was a further decline in October to 7s. 1d.; but subsequently the price became 7s. 4d., and in November it was 7s. 5d. There was no further material fluctuation up to the end of the year; the closing quotation being 7s. 5d. per quintal. The average price on the west coast was therefore about 7s. 7d. per quintal for the whole year, or about 1s. below the average for 1907. The reviewers think the producers had a much worse time of it in 1908 than in 1907; and they do not consider the present outlook for them can be regarded as satisfactory. Sales made for shipment over this year are largely on the lower scale of prices; the market is admittedly overweighted with visible supply; the efforts to reconstitute the Combination, which expires at the end of March, have not so far been successful; while the capacity to produce, though limited by the amount of labour available, is obviously much in excess of any probable consumption. In the absence of a Combination, therefore, they say it is to be feared that prices free alongside must find a lower level. In the meantime, in order to steady the market pending Combination negotiations, some 90,000 tons have been pooled; the intention apparently being to put it on the market as and when it will stand it.

The visible supply (stock and afloat) for the United Kingdom and the Continent at the end of last year was about 913,000 tons; compared with 702,000 tons and 730,000 tons at the close of 1907 and 1906 respectively. The December figures for 1908 are necessarily only estimated; but, assuming them to be correct, the present visible supply is larger by 211,000 tons than was that at the end of 1907. Assuming that 100,000 tons of the January-March shipments will arrive, and adding this quantity to the present visible supply, it will give an actual supply of 1,013,000 tons for January-April, or 119,000 tons more than the actual supply for January-April last year, which left a stock at the ports of 90,000 tons at the end of April. Even taking this estimate, Messrs. Bradbury and Hirsch think he must be a sanguine man who can expect an increase in consumption sufficient to absorb an extra supply of anything like 119,000 tons within the next four months; and they say it must strike an observer that if the quantity "pooled" had been withheld from the 1908 shipments, its purpose would have been much more effectively served, and the market would have approached the spring season in a much stronger position than is actually the case. The question of the probable consumption of nitrate of soda in the United Kingdom and on the Continent the next four months is then discussed, and this section of the "Review" is closed.

Dealing next with sulphate of ammonia, Messrs. Bradbury and Hirsch say the line of route the market would take was not at all obvious at the beginning of the year; the prospects of a sufficient increase in demand not being by any means assured, though the increase in production over the near months was not expected to be very large. They counted upon an increase in production in the United Kingdom of 6000 or 7000 tons from January to April, and upon some increase in Germany over the same period, though it had been given out that carbonizing there was about to be reduced; and they thought that prospective increased demand would hardly do more than absorb prospective supplies, and at the same time maintain the prices then current over the spring months, notwithstanding relative cheapness. The Continent was not a hopeful direction to which to look; and the financial deadlock in the United States almost precluded any increase in demand from that quarter. It was a question how far demand upon the market in the United Kingdom for the sugar-growing colonies would fall below the previous spring season's requirements, owing to German competition, not whether there would be any increase in that demand. They, however, reckoned with some confidence upon Spain for a considerable increase—to at least the extent of the falling off in the shipments for January to April, 1907, which was occasioned by floods and severe weather. They also looked for an increase in the Japanese demand; but, in view of the very heavy shipments in the later months of 1907, they did not see how the increasing pace could be maintained, though it was known that contracts existed for shipment over the early months of 1908. In order to allow the movements of exports to be traced, four tables are given showing the shipments from January to March, April, June, and December respectively. From the last we take the following figures: To France, Germany, and Belgium, 57,263 tons; to Spain and Portugal, Italy, and the Canaries, 65,831 tons; to Holland, Java, British Guiana, the West Indies, and the Mauritius, 37,000 tons; to Japan, 38,745 tons; to the United States, 28,923 tons; and to other countries, 7159 tons—making a total of 234,921 tons, against 230,537 tons in 1907, 201,456 tons in 1906, 189,349 tons in 1905, and 177,287 tons in 1904.

The tables show that the increase in exports for the three months from January to March was no less than 12,081 tons; indicating that any increase in production within this period, as well as any surplus stock at the beginning of the year, had been absorbed, and that only a bare working stock was left in the hands of producers. This was generally recognized; and in April buying commenced at once, and was continued up to the third week, at hardening prices. The closing price f.o.b. Hull was £12 7s. 6d. per ton, or 3s. 9d. per ton above that at the end of March. In spite of decreasing shipments, which commenced in April, prices were fairly well maintained until the second half of May; but from that time forward, shipments showing a rapid decrease, the market steadily declined, until, in June, the situation as far as prompt and near delivery were concerned, became hopeless. There had been a shrinkage of 10,000 tons in the exports within the three months from April to June, and a drop in prices of 16s. 3d. to 17s. 6d. per ton, according to port of shipment, within the months of May and June. With the sole exception of shipments to Spain, there had been no material increase to any country; whereas to the Continent, to the Colonies, to the United States and the Pacific Isles, and to Japan, there had been an important shrinkage in each case. Current production had, in fact, not been removed, so that there were surplus stocks again in the hands of producers.

With respect to the second half of the year, Messrs. Bradbury and Hirsch remark that all through July the market was in the "doldrums;" but they say the drop in the Hull price to £11 per ton was more than was justified, having regard to the actual requirements of the month, which were large for the season of the year. The explanation is to be found in the fact that buyers waited for sellers; and, as makers rather pressed supplies on the market, buyers had things all in their favour. However, in August the tables were very effectively turned. The Hull price recovered to £11 7s. 6d. per ton f.o.b., though there was an actual shrinkage of 2000 tons in the exports for the month. In September, production from gas-works being on the increase, and exports continuing to decrease, prices could not be sustained; but in October there was larger demand and a slight recovery in values—the closing price f.o.b. Hull being £11 5s. per ton. Prices were fairly well maintained until the second half of November; but, available supplies being more than enough to meet the demand, there was a decline to £11 per ton at the close of the month. In December as low as £10 17s. 6d. per ton was accepted; but about the middle of the month there was a reawakening. Large purchases were then and subsequently made, for December and for delivery over the spring months, at advancing prices; and at the end of the year the spot price f.o.b. Hull was £11 5s. per ton. Up to about November, producers and exporters alike clung to the idea that Japanese demand, which had saved the market in the later months of 1907, must reappear; but when it was realized that not only had actual shipments fallen far below those for 1907, but that Japan was not even inquiring for further contracts, the idea had to be abandoned, and for quite a month the market was under a cloud. It had, of course, been noticed that as the second half of the year progressed shipments to the Continent, more especially to Germany, were showing a very marked increase upon those for the corresponding period in 1907, and that in shipments to

Holland (mostly for re-export) and the Colonies there was also a substantial increase. So that, had there been even a moderate fresh demand from Japan, the course of the market must have been materially altered. The increase in shipments to France, Germany, and Belgium alone in the second half of last year amounted to 22,500 tons, compared with those for the corresponding period of 1907; in those to Spain and Italy, of 4600 tons; in those to Holland and the Colonies, of 6000 tons; and in those to the United States, of 4700 tons. But notwithstanding this, the total exports for the six months show only an increase of 2262 tons; the shrinkage in the shipments to Japan having been no less than 34,700 tons.

Messrs. Bradbury and Hirsch remark that this large increase in demand from unexpected quarters and the extraordinary falling off in requirements for Japan are matters which have seriously exercised the minds of all those engaged in the trade; and they are not yet altogether explained. Most of the increases indicated by the figures are due to shortage in available supplies in Germany, and apparently to shrinkage in production there. But has there been any such shrinkage as the figures would seem to indicate? It is not disputed that, owing to depression in the iron trade, carbonizing in the Bochum area has been reduced; but it does not follow that the output of sulphate of ammonia therefrom has been correspondingly reduced; the average yield per ton of coal carbonized having within the last year or two been substantially increased. There was certainly no decrease in the output over the first four or five months of the year—the supply being sufficient to cover not only the home demand over the season of largest consumption, but to enter actively into the export trade as well. Whatever happened, therefore, happened after May or June; and the reviewers are of opinion that part of the July-December output has been withheld from the market, and that there are stocks in the hands of producers.

With regard to the extraordinary falling off in Japanese demand, the authors say, in the first place, that the large import houses in Japan entirely miscalculated the possibilities of consumption in their own country, especially having regard to the scarcity of cash and the difficulty in obtaining payment from the actual users. In the next place, there is no doubt that each of the importers, or most of them, catered for consumption on a far too lavish scale, as though bent upon securing the lion's share of the trade, and probably ignorant of the extent to which their neighbours were providing. However this may have been, the authors think it is safe to say that, in the aggregate, the quantity purchased by the importers was far beyond the possibilities of consumption over the spring season; and this was realized by them early in the year—the January shipments from the United Kingdom determining the point beyond question.

Having regard to the main factors which determined the course of the market during the year, Messrs. Bradbury and Hirsch think that, on the whole, the level of prices was fair, though at times it may have fallen below what was justified by the actual situation. They point out that the January-December export table is not a record of real progress, and it can hardly be said that the average price for the year, f.o.b. Hull—£11 12s. per ton—does not fairly correspond with it. During the first half of the year, certainly prices were satisfactory; but so were the exports up to April. And, if due allowance is made for the failure of the Japanese demand in the second half, they think it will be obvious that, had it not been for the action of German producers in abstaining from the market so much, prices must have fallen decidedly below the level they have been able to record. It was anticipated, when the year opened, that the output of sulphate of ammonia over the spring months would be increased both in Germany and the United Kingdom; the producing capacity from carbonizing in both countries having increased within the previous twelve months. This anticipation was realized; but, as there were rumours that ovens were to be closed down owing to depression in the iron trade, it was not very certain whether the larger output would be continued later. After April, the production from carbonizing in the United Kingdom was rather less than that over the corresponding period in 1907; but there was no very serious reduction. There may also have been some decrease in Germany.

Setting the increase in spring against the decrease in the later period, the net increase from carbonizing in the United Kingdom for the whole of the past year was probably about 5000 tons. Owing to industrial depression, protracted strikes, and other circumstances, there was a decrease from gas-works; while the output from the distillation of shale was only about the same as in 1907. From blast-furnaces there was some decrease, as also from plant making producer gas. The production of ammonia, therefore, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom in 1908 is estimated at 314,000 tons, apportioned as follows:—

	Tons.
Gas-works	164,000
Iron ,,	20,000
Shale ,,	51,000
Coke and carbonizing works and producer gas	79,000
	314,000

Of this production, the authors reckon that England contributed 206,500 tons; Scotland, 105,000 tons; and Ireland, 2500 tons. The production (in tons) during the previous five years was as follows:—

	1907.	1906.	1905.	1904.	1903.
Gas-works	165,500	157,000	156,000	150,000	150,000
Iron ,,	21,000	21,000	20,000	19,500	19,000
Shale ,,	51,000	48,500	46,000	42,500	37,500
Coke and carbonizing and producer gas	75,500	62,500	46,500	33,500	27,500
Totals	313,000	289,000	268,500	245,500	234,000

Their estimate of production in 1907 was rather over the mark; the errors being mainly in the output from carbonizing and gas-works. Their figures for home consumption were therefore put some 3000 tons too high; the errors in this case being probably in the estimate of the quantity taken for chemical purposes. They say the estimate of stocks in the hands of makers would be fairly correct. Adopting these figures, the account for 1908 will stand as follows:—

	Tons.
Stock brought forward from 1907	15,000
Production during 1908	314,000
	329,000
Exports during 1908	235,000
Home consumption (for all purposes) in 1908	83,000
Stock to carry forward into 1909	11,000
	329,000

Thus the year closes with a bare working stock; production having been freely offered in recent months, and demand having been active since the middle of December. Therefore, what has mainly to be considered is the probable surplus stock now in the hands of German producers and the production in the United Kingdom and Germany over the next four months; the probable increase in other countries being only normal. Dealing with the first point, Messrs. Bradbury and Hirsch remark that, inasmuch as there are no returns available of production in Germany in 1908, the present surplus stocks can be only guessed at. It seems probable, however, that they may be anything over 20,000 tons; and, if this estimate is approximately correct, such a stock is bound to affect the market prejudicially. On the second point, they think that, though the production of sulphate of ammonia from carbonizing may be less over the next four or five months than it was over the same period of 1908, it will not be much less; while from other sources they see no reason why there should be any diminution at all. They do not consider that the output in the United Kingdom will differ very much from that which took place during the spring months of last year, but rather that it may be a few thousand tons larger.

Assuming they are right in their surmise, Messrs. Bradbury and Hirsch proceed to consider the chances of finding sufficient outlets for the production of sulphate. They say that the fact that the price of nitrate of soda stands at 30s. per ton below the level at which it stood a year ago, with no near prospect of improvement, while that of sulphate of ammonia only stands at 10s. per ton under the figure at the end of 1907, must make an important difference to the consumption in such countries as France and Germany. Last spring, sulphate of ammonia was relatively cheap, and was therefore employed as far as possible—in France certainly, and in Germany more or less. Now, nitrate of soda is relatively cheap, and consumers will revert to the use of it as far as practicable. The Continent, therefore, is not a promising outlet for sulphate of ammonia from the United Kingdom, unless German producers persist in holding for impossible prices. Japan took from the United Kingdom no less than 26,424 tons in the first four months of 1908. Will she take half that quantity this year over the same period? The authors consider there is no prospect of it at present; and they point out that a shrinkage of 13,000 tons in one direction will require a good deal of making up in others. Last year Germany was competing for Colonial, Spanish, and Japanese trades. If she keeps out of these markets in 1909, it may go far to adjust the Japanese shortage from the United Kingdom. The United States report a substantial increase in their own output; but there does not seem to be any diminution in their requirements from the United Kingdom. It appears to them, therefore, that the present level of prices is as high as is justified by the situation as they understand it. But if their judgment is at fault with regard to surplus stocks in the hands of German producers and of German production over the spring months, then there is room, they consider, for a substantial improvement in values. Or, should the nitrate of soda market make an upward move, this also would improve the chances of sulphate of ammonia. Germany, however, holds the key to the situation.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 4, sulphate was £11 15s., and nitrate £11 2s. 6d. per ton; on April 4, the prices were £12 5s. and £10 15s.; at Midsummer, they were £11 11s. 3d. and £9 15s.; at Michaelmas, they were £11 3s. 9d. and £9 12s. 6d.; while at the close of the year, they were £11 5s. and £9 12s. 6d. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1899, 7s. 11¾d.; 1900, 8s. 5½d.; 1901, 8s. 11½d.; 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; 1906, 11s. 4d.; 1907, 11s. 2d.; and 1908, 10s. 2½d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 42 years—1867 to 1908. The following are the averages for the past ten years: 1899, £11 5s. 10d.; 1900, £11 2s.; 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.; and 1908, £11 12s.

Price of Gas at Nottingham.—In reply to an inquiry by one of the City Councillors as to whether it was proposed to reduce the "excessive price of gas," Mr. A. Ball, the Chairman of the Nottingham Gas Committee, said that at present it was not intended to do so. Until they had more modern works, it was impossible to lower the charge, unless the Finance Committee would be satisfied with a smaller amount for the relief of the rates. The Corporation could not supply gas at less cost if they were to give 16-candle power and pay their workmen fair and reasonable wages.

Improvements at the Barry Gas and Water Works.—At the meeting of the Gas and Water Committee of the Barry District Council on Monday last week, the Gas and Water Engineer (Mr. T. E. Franklin) reported that the introduction of a new tar-tower had had the effect of greatly increasing the make of gas and reducing the back-pressure on the retorts. Forced-draught furnaces had been erected at the water-pumping station, with the result that only breeze was being used as fuel—32 tons having been consumed during the preceding week; thus turning to profitable use the breeze which was formerly unsaleable, and usually blocked the available storage of coke in the gas-works yard.

THE LIGHTING OF CALCUTTA'S STREETS.

Mr. J. G. Newbigging, of Manchester, as Adviser—Cabled Invitation.

The statement made in several Lancashire daily papers on Saturday, to the effect that Mr. Thomas Newbigging, head of the firm of Messrs. Newbigging and Sons, had been invited to go out to Calcutta "to advise on the lighting contract, was wrong in one very essential particular. It is not Mr. Thomas Newbigging who has been so honoured, but his son, Mr. J. G. Newbigging, M.Inst.C.E., and Chief Engineer to the Manchester Gas Committee. About three months ago, a prominent member of the governing authority at Calcutta waited upon Mr. J. G. Newbigging with the object of obtaining advice on the question of the lighting of the streets of the capital. At the conclusion of the interview, Mr. Newbigging was asked by his caller if he would be prepared to go out to Calcuttta for the purpose of giving the Council the benefit of his advice on the question of street lighting; and the reply was in the affirmative—providing the Manchester Gas Committee consented. On Friday, Alderman Gibson, the Chairman of the Manchester Gas Committee, received a cable from Calcutta asking if the Committee would grant Mr. Newbigging leave of absence for two months, so that he could go out to Calcutta and advise the Municipal Council there on the new scheme now under consideration for the lighting of the streets of the city. The question will be brought before the Gas Committee of the Manchester Corporation at their next meeting.

It is understood that the Oriental Gas Company have submitted a scheme for the better and more effective lighting of the streets of Calcutta; and members of the governing body are desirous of obtaining expert advice before coming to a decision whether to adopt electricity or gas as the illuminant, or both.

AUTOMATIC PUBLIC LIGHTING IN LIVERPOOL.

Report of the Superintendent of Street Lighting.

The Superintendent of Street Lighting to the Corporation of Liverpool (Mr. A. G. Smith) has lately presented a report on the working of the automatic controllers for lighting, reducing, and extinguishing the street-lamps, which have been in use for rather more than twelve months. Various controllers were the subject of experiment in 1906 and 1907; and in August of the latter year the Lighting Committee sanctioned the purchase of 250 additional automatic controllers, making 272 in all. They were supplied by November, and immediately fixed in various thoroughfares, in positions calculated to subject the lamps to the severest wind pressure and strain. During the experimental period, a careful record was kept of all the renewals of glass and incandescent burner fittings; and it was found that the present maintenance charge will be considerably reduced. This is attributed by the Superintendent to the new type of storm-proof lantern adopted*—which he says has entirely overcome the trouble experienced in maintaining the proper volume of supply to the lamps in the city owing to the deposit of naphthalene, and renders unnecessary the anti-vibratory arrangement in the present type of lantern—and also to the absence of vibration caused under the present system by the lighter's torch striking both the lamp-cock and the lighting-door. It was feared that, owing to the varying temperature and heavy traffic, the number of stoppages of the controllers would be very great. These fears have not, however, been realized, as the failures are but rare, amounting only on an average to 16½ per month, out of the total of 272 controllers, which is regarded as very satisfactory, bearing in mind the heavy nature of the vehicular traffic in some of the streets in which they are fixed. The total first cost of installing the experimental number of controllers amounted to £22 11s. 7d.; and it is therefore estimated that the labour charge in connection with an installation over the whole of the city would cost approximately £1500.

The records that have been kept of each controller, burner, and lamp, show the maintenance charges for the 272 in use to be for the twelve months from November, 1907, to October, 1908, as follows:—

Labour	£114	16	4
Mantles	21	2	0
Chimneys	3	4	0
Forks	0	0	6
Glass, 18s. 3d.; labour, fixing, 18s. 3d.	1	16	6
Total	£140	19	4

The average charge per lamp therefore, works out at 10s. 4d., while that for the existing type of lamps amounts to £1 9s. 2d. This figure is the result of very careful experiment. The lamp and fittings are all new, and repairs have therefore been at a minimum.

The Superintendent explains that in the estimate submitted by him for the annual maintenance charge, it is assumed that 95 lamp attendants will be required to deal with the whole of the lamps in the city; and it is proposed to pay them at the rate of 26s. per week, which, together with the week's holiday allowed, will amount to £6560. For the repairs to the controllers, an amount of £400 has been allowed; while for the labour in connection with the repairs to the columns and lanterns, a sum of £1400 has been included, which covers supervision and stores, and will, it is confidently hoped, be ample. It is pointed out that the new controller will abolish the shock to the lamps due to turning on and off the present taps, the opening and closing of the spring lighting-door of the existing lantern, and the mechanism of the anti-vibratory arrangement. On these reforms being adopted, Mr. Smith thinks it may safely be assumed that the material for the maintenance of the lanterns under the new system will be considerably reduced; and an item of £1500 has been set down, as against £2437 under the old system during 1907.

The Superintendent remarks that one of the chief features of the new system is that the lighting of the city will practically be of an instantaneous character. This will permit of the lamps being promptly lighted at the "mean" time they are dealt with at present for the six winter months, and promptly lighted for the remaining six months and extinguished throughout the year at the time these operations are now respectively completed and commenced; while the reduction of the power of the lamps at midnight can be altered to 11.30 p.m. instead of midnight in the city, and 11 p.m. instead of 11.30 p.m. in the suburbs. This would mean a saving of £2316 11s. 1d. in the charge for gas. It has been the custom, since the installation of single incandescent lamps, to allow those usually extinguished at midnight to burn throughout the night during the three summer months, as otherwise a visit by the lamplighter at midnight would have been necessary. It is pointed out that with the use of the controller this extra consumption of gas, which represents a sum of £143 17s. 5d., would be saved.

It is proposed to fit all lamps with controllers, whether in streets, passages, courts, or conveniences. This will involve the purchase of 19,000 (which includes provision for stock); showing an expenditure of £21,755 19s. 6d. It is necessary that with the controller a "pilot" should be kept continuously burning, and therefore a storm-proof lantern is essential. The existing type of lamp in its present form does not meet this requirement; and it is therefore proposed to convert it to the new type of lamp adopted by the Committee in January, 1907, which, together with the purchase of 1500 new lamps, which are necessary during this conversion and for future use, will involve a further expenditure of £13,794 6s., to which must be added £450 for "pilot" tubes; making a total expenditure, with the cost of installing previously explained, of £37,500 5s. 6d. This, however, will be reduced by £250, the value of scrap from the old lamps; making a net capital expenditure of £37,250 5s. 6d.

The Superintendent thinks that on the foregoing facts it might be argued that the system should be applied to the city at once; but this would involve the opening of a capital account and the raising of £37,250. He recommends, however, that the new system should be installed at the rate of about 4000 each year. The additional charge, therefore, on the first year's estimate would be approximately £7500. But each succeeding year the amount would be reduced by the economies effected; and on completion of the installation a sum approximating £12,000 per annum would be saved.

The following is the Superintendent's estimate of the annual maintenance cost:—

Present System.						
Wages of 14 foremen and 181 lamplighters					£12,948	19 1
Do. lamp repairers, trimmers, &c.					3,993	10 5
Materials					2,437	5 10
Total					£19,379	15 4
Automatic System.						
Wages—						
95 lamp attendants, at 26s. per week	£6422	0	0			
One week's holiday for ditto	138	0	0			
Lamp repairers, &c.	1400	0	0			
Total	£7960	0	0			
Clock maintenance	400	0	0			
Material	1500	0	0			
Maintenance of tricycles	100	0	0			
Painting lamps and columns	100	0	0			
				10,060	0	0
				£9,319	15	4
Saving in gas by promptly lighting and extinguishing the lamps	£2316	11	1			
Do. through abolition of summer lighting	143	17	5			
				2,460	8	6
				£11,780	3	10

At a meeting of the Lighting Sub-Committee on the 17th ult., the Superintendent was authorized to expend one-fourth of the amount of £7500 proposed to be included in the estimates for 1909—viz., £1875—in completing the lighting of a portion of a district with automatic controllers and lamps; and this decision was subsequently approved by the Tramways and Electric Power and Lighting Committee.

BELFAST GAS-WORKS EXTENSION.

Appointment of an Assistant-Engineer Referred Back.

The Belfast County Borough Council held their Monthly Meeting last Friday week; and among other matters considered were the minutes of the Gas Committee. These contained the report of Mr. R. J. Newell, the Local Government Board Auditor, upon the accounts of the gas undertaking for the year ended March 31 last, and a reference to the selection by a majority of the Committee (subject to the approval of the Council) of Mr. J. W. Murray, of Glasgow, as Engineering Assistant at a salary of £7 per week. It was made clear that the appointment—which was in connection with the proposed extension of the gas-works—was only to be of a temporary nature, and that the engagement would be terminable by three months' notice on either side.

Mr. J. A. Doran (the Chairman of the Committee) in moving the adoption of the minutes, said he thought it would not be out of place at this interesting period of the history of the undertaking, when there was some controversy as to the wisdom of extending the works by building a new station on some convenient site to meet the large increase in the annual consumption of gas, if he gave the Corporation some figures he had prepared to show the magnitude of the business. He thought it would be rather a surprise even to the members of the Council, who perhaps imagined they knew all about the concern. To make clear what he wished to convey, he had taken the last three years' accounts. They began in April, 1905, with a balance of £33,527; and for the three years following—1906, 1907, and 1908—the total gross

* The lamp referred to was illustrated in the "JOURNAL" for Feb. 26, 1907, p. 543.—ED. J.G.L.

profits were £185,551, which gave a sum of £221,078. Out of this, the following payments were made: Dividends and sinking fund, £56,522; depreciation, £25,176; reserve fund, £30,000; contributed in aid of rates, &c., £96,333; insurance, £2754—total, £210,785. This left a balance at the credit of profit and loss of £10,293. Considering that the price of gas was 2s. 3d. per 1000 cubic feet, less 15 per cent. and 20 per cent. discount, he was of opinion that the results were creditable to those concerned. In addition to the very low price of gas, it should be specially noted that the contribution of over £96,000 represented a reduction of 6d. in the pound on the rates for each of the past three years. He was glad to be able to state that, notwithstanding the advance made in electric lighting, their consumers had increased in number from 45,826 at March, 1904, to 69,213 at March, 1908, or an increase of 23,387 in four years; and the growth was still going on in connection with the prepayment meters. There were many other matters he might refer to; but he thought he had said sufficient to show that the Gas Committee had not been unmindful of the interests of the citizens.

The motion having been seconded, Alderman Craig opened the discussion upon it by moving, as an amendment, that the appointment of a Gas Engineering Assistant be referred back to the Committee for reconsideration. He said they had not yet selected a site for the extension of their works; and he considered it would be a great waste of public money to pay a man £1 per day at that stage. They had their own officials to advise them; and they had also brought in Sir Alexander Binnie. He could not see the use of block plans before they had selected their site and decided upon the size of the works.

In seconding the amendment, Mr. M'Cusker remarked that the whole question of sites was still in the air; and there was no necessity to engage a draughtsman. Any of their engineering officials should be able to draft the plans required. There had been a great deal of talk as to the low price of gas in Belfast; but in Sheffield the Gas Company charged a much lower rate, and in addition were able to pay their shareholders 10 per cent.

Mr. Workman said he had been in favour of adopting a particular site; but he saw that it would be difficult to convince the members of the Council as to which site was really the best, without them having all the information they could possibly get on the matter. Therefore he strongly supported the appointment of an Assistant-Engineer. They needed block plans before they could arrive at a definite decision as to what was the most suitable site; and to enable such plans to be made out, the whole question of the gas-works would require to be gone into most carefully. Minute calculations would have to be made, so as to determine the size and the relative position of the buildings; and the time of a draughtsman or engineer would be fully occupied. To say that the existing officials could do what was wanted and look after their other duties was simply absurd. He claimed to have some little experience in such matters; and he told the Corporation that it would be no loss to confirm the appointment made by the Committee.

In the course of further discussion, Mr. Gregg said that until they had decided upon the site of the new gas-works, he did not think it advisable to get block plans. Mr. M'Keown also protested against the appointment, and contended that it was only a piece of jobbery, because the Corporation at present did not know what they were going to do, except that they were to erect additional gas-works. Mr. Doran objected to the word jobbery being used, and denied that the Committee had been guilty of any such thing. Mr. Squire said Alderman Craig had referred to Sir Alexander Binnie. Had they accepted that expert's report at the time, the extension might have been made in Ormeau Park. Now, if the Harbour Commissioners were reasonable, so far as his vote went, the new works would not be placed in the park. Mr. Doran pointed out that they were not discussing the question of a site that day; and Mr. Squire (continuing) said he would leave the question of the site, with the remark that formerly he was willing to accept Sir Alexander Binnie's recommendation. In regard to the appointment of an Assistant-Engineer, none of their officials could be utilized to prepare draft plans; and before the figures which they ought to have could be put before the members, showing why they suggested certain sites, they must have block plans and the whole particulars. In Mr. Murray they had appointed one of the best men they could possibly find. Reference had been made to the price of gas in Sheffield; but Sheffield was in the heart of the coal country, and they could, therefore, manufacture gas much cheaper.

Among other speakers, Mr. Riddell thought it was exceedingly unfair for any member of the Corporation to attempt to refuse the Gas Manager the assistance which he greatly required, because it was absolutely impossible for him to make the long series of calculations which would be necessary in order to settle the dimensions of the buildings. It was absolutely essential for them to obtain the very latest information as to the erection of buildings and the suitability of site. It was impossible to proceed by guess-work; and therefore it was most necessary that a highly competent and experienced man should be appointed, in order to secure the latest and most modern gas-works. Dr. King Kerr said there were several difficulties which occurred to his mind; but it did seem to him extremely premature to appoint a man at a large salary for the purpose of drawing up plans for buildings which they did not know would ever be erected. Alderman Finnigan was also opposed to the appointment, and thought there were as good engineers and assistant-engineers in Belfast as in any other part of the United Kingdom. Mr. Phillips said the work necessary for getting out plans for the gas-works was quite beyond the knowledge of an ordinary draughtsman; and the Corporation, in his opinion, were bound to make an appointment of a highly competent man, wherever he came from. Mr. M'Mordie, too, failed to see how any man on the present staff could do the work required. He believed it was right to get the best expert they could; and it would be cheapest in the end. Alderman Tougher said the Committee were absolutely divided on the question under discussion, and this was most unfortunate; but he would suggest that the Chairman should take the matter back for reconsideration.

The Lord Mayor (Alderman Sir Robert Anderson) said an amendment of this kind placed the Corporation in a very difficult position. At the last monthly meeting, there was not a single voice raised against the inserting of the advertisement. There were 22 applications for the position; and the Committee selected the gentleman they thought best to fill it. If the amendment was passed, the Corporation would be stultifying themselves. In his opinion, it would be a most unbusinesslike proceeding. The speeches made that day should have been made at the previous meeting a month before; and the action proposed by the amendment was not only, in his opinion, ridiculous, but it would cast a slur upon the gentleman who had been appointed by the Committee.

Alderman MacMahon asked if the advertisement appeared in the Belfast papers as well as in the English and Scotch newspapers; and Alderman Craig replied that it did, but not in the same form.

Mr. Doran said he was very glad to hear the discussion, because it proved conclusively that there had been no attempt to perpetrate a job. There was no doubt that they required an extension of the gas-works, and that a man of large experience should be appointed to assist the Manager; but, for his own part, after the discussion which had taken place, he was willing to take back for reconsideration the minute referring to the appointment.

It was decided to vote on the amendment, which was carried by 23 to 14; and the minutes as altered were then passed.

OLDHAM CORPORATION GAS UNDERTAKING.

Proposed Additional Gasholder.

The Statutory Meeting of the Ratepayers of Oldham on the subject of the Bill which the Corporation intend to promote next session for various purposes, including the construction of an additional gasholder on land at Hollinwood, was held last Wednesday, under the presidency of the Mayor (Alderman Bolton). There was a good attendance, and at times there was obstruction amounting to disorder; but eventually the promotion of the Bill was sanctioned, though a demand for a poll was handed in.

The MAYOR having moved a resolution relating to the proposed improvements at the gas-works and the erection of the gasholder, to which objection is taken by the inhabitants of Hollinwood,

Alderman THOMPSON, the Chairman of the Gas Committee, in seconding the motion, dwelt upon the necessity for the extensions. He said the Corporation were asking for borrowing powers for £200,000; those obtained in 1886 being almost exhausted. Since 1854, each year had seen an increase in the quantity of gas manufactured and delivered, and last year it was 57,469,000 cubic feet, or 4·6 per cent. on the previous year. At the present time the Gas Committee could not take full advantage of the improvements made or contemplated in gas making owing to want of storage room. On the plot of land they had taken at Hollinwood, they purposed to erect a gasholder only, not works. The productive capacity at the Hollinwood works was 3,500,000 cubic feet, and the storage capacity only 2,200,000 cubic feet; and there was a maximum delivery last winter of 3,871,000 cubic feet during the 24 hours. It was easy to see from these figures that the storage capacity was deficient, for it ought to be equal to 24 hours' supply in excess of the maximum demand. Some people asked why the Committee went to Hollinwood for this extension. The whole of Hollinwood, Failsworth, Chadderton, and a large portion of Royton, were served from the Hollinwood works, and could not be served from those at Oldham or Higginshaw owing to their height. There had been a great increase in the demand for gas in the Hollinwood and Chadderton districts, especially from the new mills—an increase of 153,640,000 cubic feet a year in the last five years. If this went on, and they did not increase their storage, it would be impossible to supply the district. The works were already in Hollinwood, and it was 52 years ago that the oldest gasholder was erected; so it was no new thing to have gas-works at Hollinwood. They did not intend to enlarge the buildings there, but merely to have more storage room; and until they had it they could not dispense with the water-gas plant. When they had a full day's storage in addition to what was required for a full day's supply, the water-gas plant, so far as he could see, need not be used except in case of great emergency; and no doubt when such a time came it would be the only time that the Committee would employ the plant. They already owned the land, and they purposed putting on it a tank and gasholder at an estimated cost of £12,000. They also proposed to take power to borrow money to enlarge their plant at Higginshaw, to enable them to deal with their residual products. The total amount was estimated at £133,000. It would not, of course, be borrowed all at once, but spread over a number of years. Their last borrowing powers were not yet quite exhausted.

Mr. HARROP, who was greeted with cries of "Vote," said vital interests were being prejudiced by the course the Council were about to pursue. It might appear very inconsistent if he opposed the building of a gasholder at Hollinwood, because before the introduction of the water-gas plant he tried to get the storage increased. That plant was said to be going to do away with the necessity for a new holder, but now they were to have both. He objected to the erection of the holder on the land proposed, as being in the wrong place. What of the plans for the Bower Clough land, which had never been used, not a stick or stone being on it? Since 1886 they had been paying a very large chief rent. Now the Corporation proposed to bring a nuisance once more to the most beautiful part of Hollinwood. They would go on from storage to gas making. It would materially depreciate the property; and they should take every means in their power to stop the Committee from carrying out the work.

Mr. MIDDLETON also voiced the Hollinwood objection to the site as not being eligible. Putting the gasholder there meant that any future developments or extensions of gas plant would be made on that ground. They had done their best to make that side of Hollinwood as beautiful as such a place could be; and they held that they ought not to be exposed to these continuous attacks. The gasholder could be erected at Bower Clough.

Alderman JOHNSON, amid impatient cries of "Vote! vote!," said he could remember the time when Mr. Harrop talked very much about

the town's necessities taking the first place. The agitation was simply from this point of view: "Put the gasholder on anybody's doorstep except ours." If the holder were placed at Bower Clough, it would mean the erection of extensive new works.

The MAYOR said Mr. Middleton's proposition was out of order. He then put the motion and declared it carried.

MANCHESTER AND THE DOUBLE METER TEST.

The Manchester City Justices Gas-Meter Testing Committee, in their report for 1908, state that letters received during the year from various testing authorities show clearly an awakening of interest in the "Manchester double test" and a strong inclination to press for an alteration of the law, so that it may be made compulsory for all gas-meters to be tested, not only as to their measuring chambers, but also as to the correctness of the indexes. During the year a communication was made to Mr. W. J. Crossley, M.P., asking him to approach the Board of Trade with a view to getting an amendment of the Sale of Gas Act, 1859. It was pointed out that the meters issued by the Corporation to users of Manchester gas are fully tested; but as more than 50 per cent. of those which pass through the Manchester testing-station are for users outside the Manchester district, these are subjected only to the test provided by the Sale of Gas Act, 1859, which is an unreliable test. The Committee therefore desired to have it made compulsory for all gas-meters to be so tested that when a meter bears the official seal it shall be a correct measure, and afford protection to producer and consumer alike. Mr. Crossley replied that before doing anything the Board of Trade thought it wise to consult a number of authorities.

Early in the year the Committee wrote to Major P. A. MacMahon, the Deputy Warden of the Standards Department, asking what progress had been made as to the amendment of the Sale of Gas Act. Major MacMahon visited the Manchester testing-station on March 16, and subsequently informed the Committee that the Board of Trade proposed to appoint a small informal Committee to consider what amendments of the law were desirable for the testing of gas-meters. Mr. S. Dyson, the Manchester Committee's Inspector, was appointed to serve on this Committee, which has since met in London on several occasions, and has the matter still under consideration.

A full statement of the Committee's suggested amendments has been forwarded to the Board of Trade; and, in addition, specially designed apparatus to facilitate the operation of index-testing was submitted for the approval of the Board. The Committee now look forward to the early passing of an amending Act embodying their recommendations.

AGE CONDITIONS AT BIRMINGHAM.

At a recent meeting of the Birmingham Trades Council, a letter was read from the Secretary of the Amalgamated Society of Engineers, who stated that, it having come to his knowledge that a man was wanted at the Nechells Gas-Works to look over the steam-fittings, &c., he sent one of the members down. He was a first-class mechanic, and had first-class references, which he produced; and he had practically been appointed, when, in answer to a question, he said he was 47 years of age. He was then told he was too old; the Gas Committee having given instructions that no one over 40 years of age should be appointed. The writer thought it a pity such things should be allowed, as it was not the case of a private company, but of a corporation gas-works. As a Trade Union, they considered it was a subject for investigation.

Inquiry had been made into the matter; and personal assurance had been received from Mr. G. Hampton Barber, the Secretary of the Gas Department, that there was no rule in existence, or on the minutes of the Gas Committee, which prevented a man over 40 years of age, of any grade, obtaining a situation either at the gas-works or in the offices of the Gas Committee. The man in question, it was reported, had made a statement in the course of which he said: "I saw the person in charge, and gave him my testimonials to look at, which he said were very creditable. I also gave him to understand a portion of my time had been spent as a seagoing engineer. He was quite satisfied with me until he asked me my age; and when I said I was 47, he said, 'That's done it;' and added if I had been ten years younger I might have stood a chance." Subsequently, the Amalgamated Society of Engineers expressed the opinion that the matter should not be hushed up. "They think it a scandalous shame," the letter said, "that such a thing should be allowed to exist—that members of the Gas Committee, of whom there are a number over 40 years of age, are fit to make and administer rules and regulations, while workmen of the same age are not allowed to be employed in the municipal works." The members were sure there were working men who at the age of 40 or 50 were as fit to do their work as there were "men capable of sitting on public bodies governing—or misgoverning—the municipal affairs of the City of Birmingham."

The Chairman (Mr. W. J. Morgan) asked the Town Council what they wished to do in the matter. He had no doubt it was strictly correct to say there was no rule in existence; but at the same time more than one Committee of the Council acted on the principle that men over 40 years of age should not be taken on. He knew one Committee, on which he had a seat himself, who acted on this principle. They might send a protest to the Gas Committee; but they would only receive a denial. He thought, as the Society had taken the matter up, they should fight it out. Mr. Kesterton moved the appointment of a joint deputation from the Council and the Society to lay the matter before the Gas Committee. The Chairman said he thought it would be useless. What was at the back of the matter was the fact that there was a superannuation fund in existence. Mr. Kesterton: We should expose them in such matters, and make them reasonable. Mr. Berry expressed the view that they should wait the result of the Society's action. Mr. Simpson said the superannuation scheme had nothing to do with the matter. Before such a scheme was in existence, it was an instruction to the Committees not to engage men over 40 years of age.

Mr. Kesterton's proposition was carried.

THE FATAL GAS EXPLOSION IN BERMONDSEY.

Opening of the Inquest on the Second Victim.

Last Wednesday, Dr. F. J. WALDO, the Coroner for Southwark, opened an inquest on the body of George Henry Langley, who died in Guy's Hospital on the 2nd inst. as the result of injuries caused by the explosion in Grange Road, Bermondsey, on the previous Wednesday, as reported in the "JOURNAL" last week (p. 48).

Mr. J. WASHINGTON appeared for the South Metropolitan Gas Company; Mr. J. W. GODFREY represented the London County Council, and Mr. T. B. SHAW the Metropolitan Water Board. Mr. F. RYALL, the Town Clerk of Bermondsey, was in attendance for the Borough Council; and Captain GAMBLE and Chief Inspector BONNER watched the case on behalf of the London Fire Brigade and the Police.

The CORONER having outlined the facts of the occurrence,

Alfred Charles Langley, the father of the deceased, was again called, and, in giving evidence of identification, said he could not see that there was anyone to blame for the explosion; but he added that he should like to know the cause of it.

Louisa Maud Langley, sister of the deceased, who was too ill to give evidence at the previous inquiry, was called, and stated that at the time of the explosion she was bringing her brothers home from a party when something blew up, and she was thrown to the ground. One of her brothers went up into the air, but she could not say where the other two went. When she got up she saw one of her brothers lying on the kerb. It was not until the deceased was being taken away in an ambulance that she saw him. Some men were digging in the street, but they had no light. Farther down the road there was a watchman with a fire and lanterns all round. They were not on the ground, but on "sticks," and contained candles.

A number of other witnesses were called, including the officials of the Police and Fire Brigade, who repeated the evidence given by them at the previous inquiry.

The CORONER, in adjourning the case for a fortnight, said that a number of new witnesses would be called, and the experts would be re-examined on the evidence they had already given. He hoped to be able to conclude the inquiry in another day.

The inquiry was then adjourned till to-morrow week (the 20th inst.).

WALLASEY GAS AND WATER UNDERTAKINGS.

Application having been made by the Wallasey Urban District Council for a Charter of Incorporation, the matter has been inquired into locally by Mr. T. R. C. Dill, the Commissioner appointed by the Privy Council. The application was supported by Mr. Rigby Swift and Mr. Proctor; and the former, opening the case for the petitioners, reviewed the municipal undertakings, and gave the following particulars in regard to those connected with the supply of gas and water. He said the gas-works were constructed nearly fifty years ago by the old Local Board, and there had been small alterations from time to time until 1891, when extensions of a much more important character were taken in hand. Since then further enlargements of buildings and plant, amounting altogether to £170,283, had been made a matter of necessity by the continued rapid increase of the population. For the year ended March, 1908, the make of gas was 475 million cubic feet, the manufacture having more than doubled in amount during ten years. There were 77 miles of gas-mains in the district. Since it was established, the gas undertaking had contributed £147,200 to the rates. The depreciation and renewal fund now stood at £12,651. Among 210 gas undertakings owned by local authorities, Wallasey had the nineteenth place; and the price of gas—2s. per 1000 cubic feet—was 6½d. less than the average throughout the country. As to the water supply, the water came from wells, and there was a supplementary supply obtained, by arrangement with Liverpool, from the Vyrnwy aqueduct. There were 76 miles of mains; and in 1907 the quantity of water sent out was 771,311,309 gallons, or 33·54 gallons per head per day. The income was £20,161 in 1902 and £36,691 last year. The contribution to the rates was £3786 in 1902, and £2017 last year, but the amount carried forward was £4412, and the depreciation and renewal fund now stood at £5466.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Proposed Transfer of the Undertakings to the Municipality.

As mentioned in the report submitted by the Directors to the shareholders of the Company at the general meeting held on the 3rd of March last year, the concession for the supply of gas to Cagliari terminated on the 23rd of February; and, at the request of the authorities of the city, an extension of one year had been agreed to. Previous to this, negotiations for a renewal of the concession for a term of years had been carried on for a considerable period; but the growing desire in Cagliari to transfer the gas and water supplies to the city authorities made these negotiations very difficult. At the same time it became known that the Municipality looked for a large capital expenditure upon the water-works in order to meet the demands of the present population, and further that, in view of the non-renewal of the gas concession, the expense of administering the water concession in amicable relations with the Municipality would be proportionately increased. The Directors were consequently brought to the conclusion that it would be in the best interests of the Company to come at once to an agreement with the town for the sale of both the gas and water undertakings to the Municipality.

As a result of long and somewhat complicated negotiations, in which the Directors have been very greatly assisted by Mr. Simmelkjör, and ably represented on the spot by Mr. Sanna, a provisional contract for the sale has been entered into, and it will be submitted to the shareholders at a meeting to be held at the London offices next Tuesday.

It is unanimously approved by the Town Council of Cagliari, and the Directors strongly recommend the shareholders to confirm it.

As the contract for the supply of water was made with the Municipality of Cagliari, the Province of Cagliari, and the Government of Italy, it becomes necessary that the consent of all these contracting parties should be obtained to a transfer of the responsibilities and benefits of the Company under the contract to the Municipality. A Bill is at present before the Italian Parliament for this purpose; and, as it is non-political, it is not expected that it will meet with any opposition or delay.

The Board estimate that the arrangement, when concluded, will result in a return to the shareholders of about £26 for each £20 share, after providing for the expenses of the liquidation of the Company and for some allowance to the Directors and staff.

SALFORD COAL CONTRACTS.

The Council and the Publication of Prices.

Those members of the Salford Town Council who favour the publication in the *agenda* of details regarding contracts entered into by the various Committees, almost carried their point at last Wednesday's meeting. The subject is one which has been debated on many previous occasions by the Council; and last year when the contracts for coal required by the Gas Department were under consideration, an attempt to bring about the publication of the prices was defeated after a somewhat heated controversy.

The resolution brought before the Council last week by Mr. Pinder was to the effect that the amounts of all contracts for goods and works, as well as the terms of all special trading agreements, be set out in the synopsis of Committee's proceedings or on the *agenda* before acceptance by the Council. He pointed out that at the last inquiry regarding the Electricity Department, his Honour Judge Parry laid it down distinctly as a principle that no member of the Council was justified in giving a vote upon a matter of which he knew nothing. Mr. Pinder added that they voted £70,000 a year for coal without knowing what was paid per ton for it. It had been argued that they effected a considerable saving by not revealing the figures. But he understood that men on the Coal Exchange knew what they were; and, in any event, they could be ascertained by anyone who cared to pay a fee of 1s.

It was submitted by Mr. Bescoby that there was a great public desire for information as to these contracts, particularly those of the Gas Committee and the Electricity Committee; and Mr. Barker failed to see what could be lost by giving full publicity to all contracts and agreements. Mr. Wheatcroft, in support of the resolution, held that it was wrong, as a matter of public policy, that the Chairman of the Gas Committee should be allowed to personally negotiate for the purchase of coal. But if the Gas Committee had sinned in the way they purchased coal, he said the Electricity Committee had sinned in the way they sold, by establishing secret agreements and preferential charges. Further, he expressed the opinion that the department had reached its maximum of profit, and was going back. Mr. Barrett, however, denied that the Electricity Committee had either secret agreements or preferential customers. What they did have were differential charges.

Alderman Sir W. Stephens was of opinion that the passing of the resolution would bring disaster and untold regrets upon the Corporation; and Alderman Snape thought there were times when secrecy was not only good, but absolutely necessary in Corporation affairs.

Alderman Philips, Chairman of the Gas Committee, reminded the supporters of the resolution that the course adopted by his Committee in regard to coal contracts had had the direct and explicit sanction of the Council. He also took the opportunity to deny that he had, in the Council Chamber or outside it, boasted of having saved thousands of pounds on the placing of the coal contracts. If there had been any advantage in the policy pursued, it seemed to him that, as business men, they would be wise to profit by it without beating the drum. But not for one moment would he have it thought that he had any motive, or any interest to serve, in standing out for the contention that the prices should not be published.

After a long discussion, an amendment put forward by Alderman Linsley, postponing the matter for two months, to allow of a report being prepared by a Special Committee, was carried by 21 votes to 20. A resolution that the report be presented in a month was defeated; and Mr. Wheatcroft, on being told by the Mayor (Alderman Jenkins) that his proposition for a special meeting of the Council to discuss the matter was not in order, announced his intention of preparing a formal requisition for presentation to the Chief Magistrate. With the selection of members to serve on the Special Committee, the discussion on the subject ended.

Gas Companies and their Customers.—Following the example of other publications, the "Local Government Journal" has been publishing extracts from its issues of thirty years ago. The following is from the number for Jan. 11, 1879: "The recent [electric lighting] scare the gas companies have received may do some good if it only directs the managers' attention to the good that might result from treating the question of gas supply in the same manner as any sensible tradesman would who has to obtain a living by serving his customers civilly and well. . . . Why should accounts be forced from debtors by summary process before Magistrates when other traders are obliged to go through the ordinary course of County Courts? . . . Why should incoming tenants be punished for outgoing ones? Why should the gas be cut off, when necessitated, with every possible annoyance to the unfortunate individual? We hope those in high places will learn that all this work could be carried out without causing such annoyance to the customer as to make him always afterwards inclined to welcome any means by which the present monopoly may be lessened."

SOUTH METROPOLITAN COMPANY'S RATING APPEALS.

Objections to the Bermondsey Borough Accounts.

At the Bermondsey Town Hall last Thursday, Mr. L. N. S. Pasmore (of Messrs. Hicklin, Washington, and Pasmore) appeared on behalf of the South Metropolitan Gas Company to oppose the passing of the accounts of the Bermondsey Borough Council for the year 1907-8, by Mr. A. Carson Roberts, the Local Government Board Auditor, on the ground that certain payments made to Messrs. Dinwiddy and Sons in respect of work done in connection with the last quinquennial valuation were not in accordance with the contract made with that firm, and were excessive. Other objecting ratepayers were represented by Mr. B. Duncombe Sells, Solicitor to the Machinery Users' Association. Mr. F. J. Ryall, Town Clerk, and Mr. J. Buchman, Borough Treasurer, supported the action of the Council.

The objections were similar in character to those taken in respect of the accounts of Woolwich, Greenwich, and Lewisham, three other boroughs which enlisted the services of Messrs. Dinwiddy and Sons. In 1904 the firm was retained to value certain special properties, including the gas undertakings, by the Bermondsey Borough Council; the contract stating that 15s. per cent. on the valuations as finally adopted by the Assessment Committee should be the remuneration, *plus* £5 5s. a day for attendance at appeals if any should be taken into Court. The South Metropolitan Gas Company appealed against the valuation placed upon their properties, not only in Bermondsey, but in the three other areas mentioned. When the four appeals came on for hearing, it was agreed that one should be taken as a test case, and the others decided by it; and the result was that the Company lost. Messrs. Dinwiddy's bill of costs against them in connection with the Bermondsey appeal alone came to £775 5s. But on taxation the amount was reduced to £127 18s.; and this sum was paid by the Company. Afterwards, however, the latter found that the Council had paid Messrs. Dinwiddy the balance which had been taxed off, apart from the very large sums they had received under the contract for 15s. per cent. on valuations. As large ratepayers, the Company now appealed; submitting that the balance should be disallowed.

In support of the appeal, Mr. Pasmore urged that the terms of the contract showed that the only work not to be covered by the agreed percentage on valuations was attendance in connection with appeals; yet hundreds of letters had been charged to the four districts at 5s. and 3s. 6d. each, though many of them were merely duplicates, and large sums had been put down for clerks' time, &c. Then it was specially stated in Court that one appeal should be taken as governing the whole, in order to save expense; yet Messrs. Dinwiddy had charged each authority £5 5s. per day for the same seven days during which the appeal lasted, or about £147. In fact, everything had been charged four times over. Messrs. Dinwiddy's other bills of costs against the Company were: In Greenwich, as delivered, £1035 10s.; on taxation, reduced to £294 15s. In Lewisham, £428 18s.; on taxation, reduced to £164 13s. In Woolwich, £997 18s. 6d.; on taxation, reduced to £151 17s. 6d.

In the course of the hearing, it was mentioned that in the case of Bermondsey alone Messrs. Dinwiddy received £1809 in percentage, apart from the sum now appealed against; the £1809 being in no way objected to by the Company.

The Town Clerk defended the action of the Council, and remarked that Messrs. Dinwiddy would do their work better next time, and put the Company's assessment up. But when Mr. Pasmore drew the Auditor's attention to a report made by the Town Clerk to the Assessment Committee, in which he condemned Messrs. Dinwiddy's bill of costs, before it was paid, on the same grounds, but in stronger terms than he (Mr. Pasmore) had done, Mr. Roberts said he should certainly not give any decision till he had granted Messrs. Dinwiddy an opportunity of replying to the points raised, and, if necessary, he should arrange for a subsequent meeting.

The Town Clerk explained that after he had given his views on Messrs. Dinwiddy's account, Counsel's opinion had been taken as to the liability of the Borough Council for the balance of the firm's original bill of costs against the Company; and it was upon this opinion the Council had acted.

LIBERTY AND PROPERTY DEFENCE LEAGUE.

The Campaign against Socialism.

The Twenty-Sixth Annual Report of the Proceedings of the Liberty and Property Defence League, of which the Earl of Wemyss is the Chairman, has just been issued by the Council. The object of the League, as may be remembered, is to "uphold the principle of liberty, and guard the rights of property of all kinds against undue interference by the State." The report shows how increasingly necessary is such an organization in carrying on the campaign against Socialism.

The Council begin their report by remarking that during the first twenty years of its existence the League was apt to be regarded as an unnecessary organization to defend principles which were in no danger of being successfully assailed. Its cry of "Socialism" was described as a cry of "Wolf;" and little heed was paid to it. The march of events has changed all this. No longer a subject for mere academic discussion, Socialism has become an important factor in political life; the League's predictions have been fulfilled, and its warnings justified. To "fight Socialism" is now recognized as the urgent and paramount duty of all who love liberty and desire to preserve civilized institutions from those revolutionary influences which are openly and defiantly at work to encompass their destruction. Thousands of articles have appeared in the magazines and journals portraying the terrors of that "new moral world" for the building of which the Socialists are now preparing the way. But all this criticism and exposure fails in checking the spread of Socialism. Why? Because in both national legislation and in local administration the whole case for Socialism has

been blindly and heedlessly conceded; and this has not been realized except by the Socialists themselves.

The legislative proposals of His Majesty's Government have at last opened the eyes of the nation to the causes and consequences of the present Socialist agitation. When the Socialist members of the House of Commons warmly welcomed the introduction of the Licensing Bill, on the ground that it established the principle that the State could take private property by merely giving its owners notice to quit—a principle which Socialism would apply universally—the British people had brought home to them for the first time the real nature and aim of Socialism. In the Coal Mines (Eight Hours) Bill—another measure welcomed by the Socialists—a further example was given of Socialist policy. Once the principle of State plunder of private property and of State regulation of the hours of labour of full-grown men is admitted, there can be no logical opposition to Socialism.

The real danger by which the country is confronted is not so much the revolution threatened by the Socialists as the gradual drifting into Socialism through the misguided and reckless policy of vote-hunting political parties. It is to this danger that the League has all along been calling public attention. If Socialism is encouraged by a partial acceptance of its fundamental principles, it will grow and spread until resistance to its complete triumph will become impossible. The League takes its stand against Socialism on the firm ground that it is fundamentally wrong in principle and essentially pernicious in practice. On this ground alone can Socialism be rationally and successfully combated. The policy that seeks to defeat it by administering the Socialist poison in mild doses is one that is alike foolish and fatal. If personal liberty and private property are good things—as the greatness and glory of England testify—then the more secure they are made the better for each and for all. To make their possession less and less secure by repeated acts of governmental restriction and plunder, is to destroy the foundations and shatter the fabric of individual and national prosperity, and pave the way to the establishment of a State despotism under which individual freedom and private rights will be unknown. It remains for the thoughtful and propertied classes to henceforth insist that parliamentary and local government shall be confined to those simple duties for which they primarily exist; that political policy shall be subordinated to national interests, and not directed to party aggrandizement or framed to give effect to the fads and wild schemes of visionaries and revolutionaries. If this be done, the triumph of Socialism will be rendered impossible, and the nation saved from that dire disaster which will inevitably follow should the present drift into communistic arrangements be allowed to continue unchecked.

In the concluding portion of their report, the Council say that while the membership of the League continues to increase, the funds available for the great work in which it is engaged are far from adequate. If each owner of any kind of property subscribed a very small sum every year towards a fund to be used in defence of the interests of property owners generally, the League would, they say, be in a position to give a far more favourable account of its proceedings than is the case on its present altogether inadequate resources. With its active Council and Committees, with its perfect machinery for parliamentary purposes, and with its properly equipped departments for propagandist work, there are unlimited possibilities for the League's usefulness, if only those who believe in its principles and objects will encourage its activity by substantial financial support.

LONGTON GAS AND ELECTRICITY UNDERTAKINGS.

The "Local Retrospects for the Year 1908" in the "Staffordshire Sentinel" last Thursday were devoted to Longton; and the following remarks were made in regard to the gas undertaking, which, as well as the electricity supply undertaking, is under the supervision of Mr. W. Langford: "The ratepayers of Longton have the gratification of knowing that the borough gas-works occupy a high position in the country for their efficiency and returns, and the new federated district will find in the undertaking a valuable asset. The working returns of the gas-works were shown by a recent analysis to rank second highest in carbonizing results among the statistics for 121 similar undertakings in various parts of the country, including London, Birmingham, Manchester, and other large cities. Therefore, although the capital account is a high one, the Longton works are, owing to their excellent and economical management, able to sell the commodity at as low a price as any of the neighbouring towns. In March last, the handsome sum of £2500 was handed over to the borough fund, out of the profits of the undertaking, for the relief of the rates; and the Committee pledged themselves to increase the amount and subscribe £3000 during the ensuing financial year. In addition to this tangible concession, the price of gas was reduced in March from 2s. 11d. to 2s. 9d. per 1000 cubic feet; and there was a further reduction in September to 2s. 6d. per 1000 cubic feet net; while gas used for motive power and other manufacturing purposes is now sold at from 2s. 3d. to 1s. 9d. per 1000 feet, according to the quantity consumed. The Gas Committee have continued to provide cottage houses with fittings free of charge, on the slot principle, at the rate of 300 a year, and to-day nearly the whole of the householders in Longton are gas consumers. Therefore, under the federation settlement (whereby gas is to be sold at cost price), all profits now made will go to the consumers. No new capital outlay was incurred at the works during 1908; but out of the revenue a new engine-room was erected on modern lines to accommodate two double sets of exhausters. The building is conveniently designed, and is neatly fitted with tiled walls and varnished woodwork. It replaced the only fabric that remained of the original structure of the works erected in the sixties. What, speaking comparatively, was rapid progress, marked the work of the Electricity Department during the year, and the development was in relation to current used both for lighting and motive power."

At their meeting last Friday week, the Tenterden Town Council decided to take proceedings against the Gas Company if they failed to abate within fourteen days a nuisance alleged to be caused by the passing of a foul effluent from the gas-works into an adjoining ditch.

EXMOUTH WATER BILL.

Adverse Vote of the Ratepayers.

The proposal of the Exmouth Urban District Council to promote a Bill for the improvement of the water supply, failed last week to secure the assent of a statutory meeting of the ratepayers. For some time past experimental borings have been carried out at Newton Poppleford, at the suggestion of Professor Boyd Dawkins and Messrs. Hill and Son. A contract was entered into for a boring to the depth of about 200 feet, at a cost of £660; and though this depth has been exceeded, the Council have confidence in the scheme, and proposed to obtain parliamentary powers for the expenditure of £43,000 upon it. At a meeting of the Council yesterday week, a resolution confirming the decision to promote the Bill was passed; and a meeting of the ratepayers followed.

Mr. Daw, the Chairman of the District Council, reminded the meeting of the serious crisis two years ago, when the water nearly gave out and a temporary supply had to be hurriedly obtained. He said it was estimated that the cost of the proposed scheme would be £38,000; and it was proposed to ask for power to borrow £5000 in addition, to be spent as required. Roughly speaking, a rate of 8d. in the pound would be necessary; and this would be decreased as the rateable value of the town grew. It was absolutely necessary to have a proper supply of water. If the present boring proved unsuccessful, the scheme, of course, would be dropped. It was, however, supported by the highest authority; and an expenditure of about £4000 had been already incurred in the preliminary boring and the promotion of the Bill. Mr. Abell, the Chairman of the Water Committee, also remarked that they had secured the best advice on the subject; and if the scheme were rejected, there was nothing to take its place, and the £4000 already spent would be thrown away.

Mr. MacMorland, a ratepayer, contended that the scheme had been adopted without proper consideration, and that there was sufficient water to be obtained from the present source without going farther afield. The Chairman explained that, under a former Act, the Council were prohibited from boring upon their own property; but a clause in the present Bill would remove this stipulation. Mr. Rendell also contended that sufficient water could be obtained by driving an adit through the watershed, with branches, so as to collect the water percolating through the pebble strata. The Rev. O. J. Reachell, a member of the Council, opposed the scheme, which he said had been rushed through the Council hastily, and was very costly. He was afraid the experts had taken a too large and magnificent view of the requirements of Exmouth. There were other expedients which should be tested; and, in any case, they ought to know what they were going to get before they asked Parliament to sanction the scheme.

The Chairman, answering questions, said the contractor had been paid £980 on account of the boring, and more was due. In addition to this, they had the liability for the Engineers' fees, the cost of Professor Boyd Dawkins's advice, and the legal expenses in connection with the promotion of the Bill. If the Bill were dropped, all this, amounting to about £4000, would have to be met out of the rates. The matter was urgent, because of the injury done to the reputation of the town by the report that the water supply was inadequate.

On a vote being taken, only fifteen hands were held up for the resolution, and a large number voted against it.

Another meeting of the District Council was held on Wednesday evening. The Chairman (Mr. Daw) contended that nothing whatever would be gained by dropping the Bill, for, even if the well proved unproductive, the bulk of the costs had been already incurred. Though the Bill provided power to borrow £43,000, it did not follow that the expenditure would amount to this sum. If it were possible to utilize the borehole for pumping, it was estimated that the total capital expenditure for some years would be only £23,000. The items bringing the estimate up to £43,000 were: Boring a well with adits, £9000; doubling the pipe-line, £6000; extension of mains, £5000. Neither of the two last-named items would be required for some years. A capital expenditure of £23,000 would represent a yearly rate of 4½d. in the pound. The Chairman also read a letter from Messrs. Hill and Sons, the Engineers, who said that nothing in the execution of the trial boring had occurred to make the chance of a supply less favourable than when it was begun. In about a month, at the latest, they expected that the pebble beds, which they now appeared to have reached, would be passed through, and the pumping test begun. They believed it would be favourable. Exmouth, they pointed out, was undertaking no more than other towns; and they presumed that the Council would finish the boring and see the result. Mr. Abell referred to suggestions which had been made of possible alternative schemes, and said the cost of any other scheme would be greater than that of the one which they had begun. The Rev. O. J. Reachell thought that the engineers ought to have given them a report on alternative schemes and their cost. It was decided to take a poll of the town on the question of proceeding with the Bill.

New Issue of Capital by the Enfield Gas Company.—The invitation in the "JOURNAL" for the 22nd ult. for tenders for £7000 of consolidated ordinary stock of the Enfield Gas Company brought applications for £28,490 of stock. The prices offered ranged from £108 per £100 (the minimum price fixed by the Company) up to £115. The whole issue of £7000 realized an average price of £111 6s. 8d. per £100. The £5000 of 4 per cent. perpetual debenture stock offered for sale at the same time realized £100 6s. 10d. per cent.

Further Issue of Capital by the Portsmouth Water Company.—It will be seen, from an announcement which appears elsewhere, that Messrs. Hall, Pain, and Goldsmith will conduct on Thursday, the 21st inst., the second sale of shares of the Portsmouth Water Company, under the Company's Act of 1906. There are 2000 shares of £5 each to be sold, and they will be offered by auction in convenient parcels to suit investors having a moderate amount of capital. The statutory dividend upon them is 5 per cent.; and the Company have paid full dividends on all classes of shares for more than 28 consecutive years. The shares are officially quoted on the London Stock Exchange.

WATER-WORKS IN COREA.

Completion of the First Supply Plant.

The following report concerning the completion of the water-works in Seoul, and the proposed construction of similar works in other Corean cities, is furnished by Mr. T. Sammons, the American Consul.

The problem of providing Corean cities with pure water is receiving the serious attention of the Japanese Protectorate. Under this the Corean Government will, in the near future, complete public water-works at Chemulpo, the chief seat of the empire, and at Pingyang, the principal commercial mart with the exception of Seoul. At Fusan the new water-supply plant is owned jointly by the Government and private individuals. The first plant to be completed in Corea, however, was chartered and built by Americans at a cost of £250,000. The materials and supplies used, with the exception of the cement and miscellaneous articles, were purchased through American firms. This plant has been accepted by a British Syndicate, and is now in working operation in Seoul. Active construction work was begun in September, 1906, and the completed works were handed over to the Corean Water-Works, Limited, on the 23rd of July last, six weeks before the contract date of completion.

The plant is on the bank of the Han River, from which the water is drawn, and is protected from floods, which occasionally cover the banks, by earthwork 10 feet in height. The station buildings are of brick, with granite facings. They are lighted by a 6-kilowatt dynamo, connected direct to a vertical engine of 8-H.P. The steam is supplied from a battery of boilers with superheaters, with which economizers are used. The chimney is of brick, 5 feet in internal diameter and 103 feet high. The water is pumped from the river to the settling reservoirs by 12-inch centrifugal pumps in duplicate, direct-connected to 36-H.P. vertical compound condensing engines. The total capacity is 4 million imperial gallons per 24 hours. After filtration, the water is raised to the service reservoir by two direct-acting triple-expansion pumping-engines, having a total capacity of $3\frac{3}{4}$ million gallons per 24 hours. The power-house is arranged for the installation of more machinery as occasion requires, so that the plant may be doubled.

Each of the two settling reservoirs is 158 feet square, with a water depth of 8 feet. From them the water flows by gravitation to the filters, five in number, each having a superficial area of 900 square yards, with ample room for extension. After filtration, it passes to the clear-water basin, from which it is pumped to the service reservoir. This is located on a spur of Namsan Mountain, outside the city wall. It is 120 feet in diameter and 22 feet deep. All these reservoirs or basins are of concrete—1 part of cement to $2\frac{1}{2}$ parts of sand and fine broken stone. They were plastered inside with mortar (1 part of cement to 2 parts of sand, the cement receiving 1 per cent. of alum and the water 1 per cent. of soap). This made them almost water-tight. The filters and clear-water basin are roofed with reinforced concrete, covered with 15 inches of earth to prevent freezing. The cement used was Japanese, manufactured and tested under the Japanese Government specifications.

The main pipe-line is of steel. For the purpose of saving freight, it was taken out nested in three sizes, $19\frac{3}{8}$, $21\frac{15}{16}$, and $22\frac{3}{8}$ inches in diameter. The pipe is all lap-welded, and laid with lead joints. With the exception of about a mile of 16-inch steel main, the distributing-pipes are of cast iron, varying from 3 to 12 inches in internal diameter. There is a total of 5 miles of steel pipe and 30 miles of cast-iron pipe in the system. Under the contract, provision was made for 216 fire-hydrants and 630 service hydrants for street use; but some of the latter have been held in reserve until experience indicates where they are most desired. Water is to be sold from these service hydrants to the poorer people, through the Water Carriers' Guild; but others will have private services in their houses.

Industrial Advantages of Newport (Mon.).

Some time ago, the Newport Corporation, the Harbour Commissioners, and the Chamber of Commerce nominated a Joint Committee, composed of the commercial men of the town, with the view of bringing to the notice of manufacturers the claims of Newport as a shipping and manufacturing centre. Alderman T. Canning, the Engineer and Manager of the Newport Gas Company, was elected Chairman; and he had the wide experience in business affairs of Mr. A. J. Phillips, the Clerk to the Harbour Commissioners, as Secretary. The Committee lost no time in getting to work, and the result is that there has just been issued, under the editorship of Mr. Phillips, a useful little book, entitled "Newport a Shipping and Manufacturing Centre," which contains cogent arguments and facts in favour of the selection of the town for new works. With regard to the supply of water, power, and light, the following facts are adduced: "The Corporation, after they acquired the undertaking of the private Company who constructed the first works, determined to provide for the great industrial development which they foresaw; and in 1904 they completed the Wentwood reservoir, with a capacity of 395 million gallons, which brought up the total storage to 660 million gallons—ample for all needs. The water charges are low, and the Corporation make special terms for industrial purposes; the charge being 3d. per 1000 gallons. They also own two electricity works—one for the supply of lighting by alternating current (single phase, at 100 and 200 volts pressure); the other large power works for the supply of continuous current, both for lighting and for power purposes. The charges made for current are extremely moderate. The town is well supplied with gas from the modern and well-equipped works of the Newport Gas Company; and one special feature among others to which attention may be called is the great development of the Company's prepayment system, which has added greatly to the comfort and convenience of the homes of the artisan and working-class population."

Water Scheme for the Coggeshall District.—At the meeting of the Braintree Rural District Council on Wednesday, it was decided to accede to the application of the parishes of Great and Little Coggeshall and Kelvedon for a water scheme, to cost £3000; and the Clerk (Mr. A. Hills) was instructed to give notice of the Council's intention to apply to the Local Government Board for sanction to borrow the money.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 91.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 15	10	Alliance & Dublin 10 p.c.	18¼—19	..	5 5 3
268,324	10	,,	7	Do. 7 p.c.	12½—13½	..	5 5 8
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
200,000	5	Oct. 29	6⅓	Bombay, Ltd.	5⅝—5⅞	..	5 10 8
40,000	5	,,	6⅓	Do. New, £4 paid	3⅝—4⅛	..	6 6 1
50,000	10	Aug. 27	14	Bourne-	10 p.c.	..	29—30	..	4 13 4
51,810	10	,,	7	mouth Gas	B 7 p.c.	..	16½—17	..	4 2 4
53,200	10	,,	6	and Water	Pref. 6 p.c.	..	15½—16½	..	3 13 10
380,000	Stk.	Aug. 13	12½	Brentford Consolidated	247—250	+1	5 0 0
300,000	,,	,,	9⅜	Do. New	187—190	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk.	Sep. 11	10⅔	Brighton & Hove Orig.	213—216	..	4 19 6
246,320	,,	,,	7⅛	Do. A Ord. Stk.	153—156	..	4 19 4
467,000	20	Oct. 15	10	British	42½—43½	..	4 11 11
109,000	Stk.	Aug. 27	6	Bromley, Ord. 5 p.c.	114—116	..	5 3 5
165,700	,,	,,	4⅓	Do. do. 3⅓ p.c.	84—86	..	5 4 8
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	11½—12	+⅛	5 16 8
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
150,000	20	July 15	7½	Cagliari, Ltd.	25½—26½	..	5 9 5
103,000	10	—	—	Cape Town & Dis., Ltd.	4½—5⅛	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c. Pref.	4⅝—5⅛	..	8 3 8
52,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	47—49	..	6 2 5
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	70—78*	..	5 15 5
157,150	Stk.	Aug. 13	5	Chester 5 p.c. Ord.	110½—112½	+1	4 8 11
1,493,280	Stk.	Aug. 27	5⅝	Commercial 4 p.c. Stk.	106—108	..	4 16 4
562,000	,,	,,	5	Do. 3⅓ p.c. do.	103—105	..	4 15 3
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6⅓	Continental Union, Ltd.	99—101	+4½	6 8 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—138	..	5 1 5
467,170	Stk.	—	5	Derby Con. Stk.	122—124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Sep. 30	5	East Hull 5 p.c. Ord.	98—100	..	5 0 0
486,090	10	July 15	12	European, Ltd.	23½—24½	..	4 19 0
354,060	10	,,	12	Do. £7 10s. paid.	17⅞—18	..	5 0 0
15,182,590	Stk.	Aug. 13	4/10/8	Gas	4 p.c. Ord.	101—102	+1⅛	4 8 10
2,620,000	,,	,,	3⅓	light	3⅓ p.c. max.	89½—90½	+½	3 17 4
3,793,735	,,	,,	4	and	4 p.c. Con. Pref.	106½—107½	+⅛	3 14 5
4,193,975	,,	Dec. 11	3	Coke	3 p.c. Con. Deb.	84½—85½	..	3 10 2
258,740	Stk.	Sep. 11	4⅔	Hastings & St. L. 3⅓ p.c.	95—97	..	4 17 11
82,500	,,	,,	6⅔	Do. do. 5 p.c.	113—115	..	5 8 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	18—18⅛	..	5 18 11
123,570	Stk.	Sep. 11	6⅓	Ilford "A" and "C"	131—133	..	4 17 9
65,780	,,	,,	5	Do. "B"	103—105	..	4 15 3
51,000	,,	Dec. 30	4	Do. 4 p.c. Deb.	102—104*	..	3 16 11
4,942,000	Stk.	Nov. 13	8	Imperial Continental	179—181	..	4 8 5
473,600	Stk.	Aug. 13	3⅓	Do. 3⅓ p.c. Deb. Red.	95—97	..	3 12 2
195,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	Aug. 27	10	Liverpool United A.	226—223	..	4 7 9
718,100	,,	,,	7	Do. B	167—169	..	4 2 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.	105—107*	..	3 14 9
75,000	5	Dec. 11	6	Ma'ta & Medn., Ltd.	4⅝—4⅞	..	6 3 1
550,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4⅓	Melbourne	4⅓ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 13	3⅓	Monte Video, Ltd.	11⅛—12	..	5 16 8
1,775,892	Stk.	July 30	4/12/6	Newc'tle & G'tesh'd Con.	109—111	+½	4 3 4
418,460	Stk.	Dec. 30	3⅓	Do. 3⅓ p.c. Deb.	91—92*	..	3 16 1
15,000	10	Aug. 27	10	North Middlesex 10 p.c.	20—20⅓	..	4 17 6
55,940	10	,,	7	Do. 7 p.c.	13⅛—14	..	5 0 0
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—142	..	5 12 8
60,000	5	Sept. 30	8	Ottoman, Ltd.	6⅛—6⅜	..	6 5 6
31,830	53	Aug. 27	13	Portsea Island A.	138—140	..	4 18 6
60,000	50	,,	13	Do. B.	132—134	..	4 17 0
100,000	50	,,	12	Do. C.	122—124	..	4 16 9
114,800	50	,,	10	Do. D and E.	104—106	..	4 14 4
398,490	5	Oct. 29	7	Primitiva Ord.	5½—6	..	5 16 8
796,980	5	July 30	5	Do. 5 p.c. Pref.	5⅛—5⅜	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
1,200,000	10	Oct. 15	8	River Plate Ord.	13¼—13⅜	+⅛	5 16 5
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95*	..	4 4 3
250,000	10	Sept. 30	8	San Paulo, Ltd.	14—14½	..	5 12 3
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—50*	..	5 0 0
135,200	Stk.	Sept. 11	10	Sheffield A	240—242	..	4 2 8
209,984	,,	,,	10	Do. B	240—242	..	4 2 8
523,500	,,	,,	10	Do. C	240—242	..	4 2 8
70,000	10	Oct. 29	10	South African	13⅛—14	+⅛	7 2 10
6,429,895	Stk.	Aug. 13	5/6/8	South Met., 4 p.c. Ord.	121—122	+1	4 7 4
1,895,445	,,	July 15	3	Do. 3 p.c. Deb.	85⅛—86⅛	..	3 9 4
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 13	5/6/8	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	121—123	..	4 1 4
117,058	,,	July 15	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
502,310	Stk.	Nov. 13	5	Southampton Ord.	107—109	..	4 11 9
120,000	Stk.	Aug. 13	6⅔	Tottenham	A 5 p.c.	134—136	..	4 19 3
398,940	,,	,,	5⅓	and	B 3⅓ p.c.	106—108	..	4 17 3
149,470	,,	Dec. 30	4	Edmonton	4 p.c. Deb.	100—102*	..	3 18 5
182,380	10	,,	8	Tuscan, Ltd.	9—9⅜*	−⅛	8 8 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	98—100*	..	5 0 0
193,742	Stk.	Aug. 27	5	Tynemouth, 5 p.c. max.	106—108	..	4 12 7
255,636	Stk.	Aug. 27	6⅓	Wands-	B 3⅓ p.c.	128—130	..	5 0 0
79,416	,,	Dec. 30	3	worth and Putney	3 p.c. Deb. Stk.	72—74*	..	4 1 1
835,872	,,	Aug. 27	5⅓	West Ham 5 p.c. Ord.	112—114	..	4 9 11
210,000	,,	,,	5	Do. 5 p.c. Pref.	124—126	..	3 19 4
253,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—107*	..	3 14 9

Prices marked * are "Ex div."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

My attention has been called to the fact that in the article published last week regarding the Order of the Edinburgh and Leith Gas Commissioners, the time allowed by the Act of 1888 for the redemption of annuities and repayment of borrowed money was greatly over-estimated. Under the normal operations of the sinking funds, I have ascertained, annuities would be redeemed in 51 years, and borrowed money repaid in 49 years. That is to say, that all the annuities would be redeemed in 1939, as against 1938, the period required by the new Order; and the £800,000 to be borrowed now would be repaid in 1949, as against 1938. If this be so, the imposition of the 2d. per 1000 cubic feet was surely a work of supererogation, and its effect will naturally be to produce more money than will be necessary for the purposes named; and the harsh nature of the measure is not removed by the knowledge that the ordinary means at the command of the Commissioners would have sufficed, and would certainly have left them much greater freedom.

The Western Juniors to-night discussed "Labour Questions," introduced by a paper read by Mr. S. B. Langlands, formerly of Coleraine, now Chief of the Corporation Lighting Department in Glasgow. Mr. Langlands' sympathies are with the workers, and, from the remarks which were made in the course of the discussion, most of the speakers appear to be like-minded. As we are told that the juniors of to-day are to be the managers of to-morrow, the prospect is that, if the optimism of youth should survive under the responsibilities of office, there are much happier days in store for working men, at least for those employed in gas-works. The cure for labour troubles which was most advocated was the finding of some means—not yet visible, but felt to be in existence somewhere, as the great planet, the discovery of which was reported the other day, is said to have been—whereby working men could be led to take an interest in the undertakings they serve. If there is a glimmering vision of the something which is sought for, it is in some scheme of profit-sharing. But the difficulty arises here that, while it has been proved that such schemes are possible and profitable under company management, the same cannot yet be said of undertakings under municipal control; and the late Sir George Livesey is reported to have said that such a thing was impossible. It is true that Sir George's opinion need not be taken as settling the matter for all time, because the world is ever moving on, and what was impossible in his day may yet be found to be possible. There was a suggestion made that superannuation might be a substitute, if not a means in itself. But superannuation is just another form of paying higher wages; and there is no reason why this method of treating labour questions should not be adopted at once by corporations as well as by companies, if by that means the improvement of the condition of the workers would really be advanced, which is doubtful. The best means for the cure of labour troubles is to prevent them—by being just, even generous, to the workers; and that does not entail much thought or anxiety. This may be a cavalier way of dismissing a subject which is engaging much attention; but, in the main, it will be found to be correct.

In the Glasgow Town Council on Thursday, on the motion of Mr. Pratt, it was remitted to the Parliamentary Bills Committee to consider and report upon the whole subject of the assessment of the underground works of the Water, Gas, Electricity, and Tramway Departments of the City, with a view to having the law altered under which, at present, these subjects are assessed, in counties upon one-fourth of their annual valuation, and in burghs upon their full valuation.

Yesterday an inquiry was held in Edinburgh, under the Fatal Accidents Inquiry (Scotland) Act, into the circumstances attending the death of Henry Landale Graham, a baker who, as mentioned a few weeks ago, was injured by an explosion of gas in the bakehouse in which he worked in South Bridge, Edinburgh, and who died a few days after the accident. The explosion happened when the man, on a Monday morning, opened the door of the oven to begin work. The jury found that the cause of the accident was the gas-bracket having been inside the oven; and that had it been outside, in all probability the accident would not have occurred.

Advice given by irresponsible persons is usually regarded as of little value; and I dare say this will be found to be the case with a series of suggestions which are contained in a newspaper article published in the "Dundee Advertiser" last Thursday, regarding which the explanation is given by the Editor that it is contributed by a correspondent. The quality of the contribution may be gauged by the recommendation to establish depôts at the east, west, and north of the city, where *débris* could be loaded and conveyed, in electric waggons, to such places as the harbour, where it might be used to reclaim what would be valuable land. "Another direction," the writer goes on to say, "in which economy might be served is that the Gas Engineer might be assisted to still add to his already 'great reductions' in the price of gas, by allowing him to supply an illuminant of (say) 15-candle power, instead of from 19 to 20 as at present. With such a reduction in candle power, gas could be supplied at about 3d. per 1000 feet cheaper than the present rate—a saving of £9600 on the 771 million cubic feet sold, or equal to about 3d. in the £1. It is well known that gas of 14 or 15 candle power, with incandescent burners, will give a far superior light to gas of 19 or 20 candle power with flat-flame burners. It would also be the means of increasing the consumption for power and heating purposes, and thereby enable the cost to be still further reduced. At the present time, gas of this quality is being supplied in London and elsewhere with excellent results. In Berlin and other Continental cities, gas of 12 candle power is supplied. The average candle power for England is 15 to 16; the average for Scotland is 18 to 20."

The annual supplement of the "Glasgow Herald," dealing with shipbuilding, engineering, commerce, shipping, &c., published on Wednesday, the 30th ult., contained, as usual, a great mass of information regarding the trade of the past year. The supply of town's gas does

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not find a place in the wide range surveyed by the compilers. They have, however, contributed an article upon producer gas plant, in which they state that this type of plant "has not yet lived up to the expectations of its supporters, but every day is seeing it taking its place more surely as the power-producing plant of the future. The evolution of the steam turbine has probably more than anything else delayed the progress of producer plant; but as the development of the high-powered internal combustion engine proceeds, the turbine will, in turn, be displaced, although the step from the rotary prime mover to the reciprocating will be retrograde. The ultimate prime mover will undoubtedly be the internal combusion turbine, combined with a producer plant utilizing the cheapest classes of fuel. The gas turbine is, however, very much a thing of the distant future, though there are already several workers in the field, and we may at any time hear of the step being made from which the motor of the future will be evolved. The future of the gas producer is one of great promise. It has now invaded every field in which steam has hitherto reigned supreme. For small power plant, the producer has proved itself particularly suitable. In its application to large units, considerable difficulties have been met; and for some time the system has suffered from a reputation for general unreliability, gained by the early installations. In America, however, power-gas plants are now being operated with every success, particularly in connection with large rolling-mills, where furnaces have for years past been discharging millions of horse power in the form of gas into the atmosphere. The full utilization of blast-furnace gas has not yet received the attention in this country that it deserves, but no doubt at no distant date the question will be taken up more seriously. Developments during the past year were chiefly in the direction of reducing the design of the generator to the least complicated possible. It has also been found desirable to pay more attention to the calorific value of the fuel to be employed, the dimensions of the generator being varied accordingly. Where large gas supplies are required, and the demand is liable to fluctuation, the pressure type of plant has clearly proved its superiority, and recent developments in this type have been chiefly towards securing a clean gas from the lower grades of fuel. The whole future of the gas producer of any but the smallest size is bound up with the employment of bituminous fuels. Coals rich in carbon and low in volatile matter, such as anthracite, are easily gasified; but the gasification of bituminous coal, rich in tarry constituents, presents many difficulties."

A paper was submitted recently by Miss Bertha Chandler, M.A., B.Sc., to the members of the Edinburgh Association of Science and Arts, on "The Perfect Light." Miss Chandler's objective was phosphorescence and allied phenomena. She called attention to the widespread nature of the phenomenon in Nature; phosphorescence being found in the mineral, animal, and vegetable worlds. She mentioned many substances which possessed the property of phosphorescence. The researches of Professors Langley, Young, and Very, the lady said, showed that the phosphorescent light of the firefly has 100 per cent. illuminating power, as compared with 30 per cent. in an ordinary gas-flame, and 35 per cent. in sunlight; the remainder being heat and chemical rays of no value for illuminating purposes. Possibly in the future, she surmised, such a heatless inexpensive light might be utilized. It is something worth our knowing that, according to the three learned Professors named, the light of an ordinary gas-flame—a flat-flame burner, I presume—is only 5 per cent. below that of sunlight. If this be so, what about the incandescent gas-burner? She did not bring it into comparison, so that it apparently outshines even the firefly.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Jan.* 9.

The year has opened with a good demand, and, though available supplies are fairly abundant, all parcels offered have found a ready market at hardening prices. The closing quotations are, consequently, £11 10s. per ton f.o.b. Hull, £11 11s. 3d. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. There has also been good inquiry in the forward position; but the firmness of makers has prevented much business. The large Scotch and London makes, having been for the most part sold in advance, have not been much on the market.

Nitrate of Soda.

Owing to inflated visible supplies, this market is dull in all positions. The spot price of 95 per cent. is 9s. 6d. per cwt., and of refined quality 9s. 9d.; and the same prices would be accepted for delivery over the spring months.

Tar Products. LONDON, *Jan.* 11.

Pitch is quiet, and it is very difficult indeed to do any business on the Continent, except for delivery for a long period ahead at about to-day's prices. Business on these terms does not meet with the approval of dealers, who do not care to risk long forward contracts on such a low basis. No sales of London pitch have been reported; but the value of this article, on the basis of sales which have lately been made on the Continent, is not over 18s. to 18s. 6d.; while on the east coast 18s. has been accepted for delivery to the end of June next. On the west coast, 17s. 9d. has been taken for delivery to the end of September. Creosote is firm; but it is still possible to buy outside makes at 2¾d. to 2⅞d. Large makers, however, are asking 3d. to 3⅛d., and in some cases 3¼d. In the Midlands, the market is unchanged, and 2⅝d. is generally quoted. In Yorkshire, 2¾d. is stated to have been paid, and the same price in the Lancashire district. Benzol 90 per cent. is very weak indeed; and 5¾d. has been accepted, f.o.b., on the east coast for delivery to the end of June next. 50-90 per cent. benzols are quiet; and it is doubtful whether they are worth more than 6¾d. on the east coast. Toluol is steady, but there is not much demand for it at present. Solvent naphtha maintains its position, but is not quite so firm as was the case a few weeks ago. Carbolic acid is quiet, and Continental consumers decline to offer more than 1s. per gallon for 60's on the east coast. Naphthalene keeps its price with difficulty; and salts are fairly

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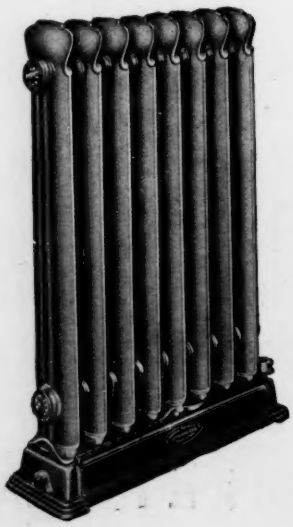

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firm. The gas companies report having sold anthracene at 2d. per unit, but ordinary makers cannot secure anything like this figure.

The average values during the week were: Tar, 10s. 9d. to 14s. 9d., *ex* works. Pitch, London, 18s. to 18s. 6d.; east coast, 18s. to 18s. 3d.; west coast, 17s. 3d. to 18s. 3d. f.a.s. Mersey, 17s. 6d. to 17s. 9d. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6¼d.; North, 5⅞d. to 6d.; 50-90 per cent., casks included, London, 7⅛d. to 7⅜d.; North, 6⅞d. to 7d. Toluol, casks included, London, 9d. to 9¼d.; North, 8½d. to 8⅝d. Crude naphtha, in bulk, London, 3⅞d. to 4d.; North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11d. to 11¼d.; North, 10d. to 10⅛d.; heavy naphtha, casks included, London, 11d. to 11¼d.; North, 10d. to 10⅛d. Creosote, in bulk, London, 2⅞d. to 3d.; North, 2⅝d. to 2¾d. Heavy oils, in bulk, 3d. to 3⅛d. Carbolic acid, 60 per cent., casks included, east coast, 1s. to 1s. 0¼d.; west coast, 11⅞d. to 1s. Naphthalene, £3 10s. to £6 10s.; salts, 35s., packages delivered and f.o.b. Anthracene, "A" quality, 1½d. to 2d. per unit, packages included and delivered.

Owing to a clerical error on the part of our correspondent, the price of creosote was last week given as 2¼d. to 2½d., whereas no change was reported in the market. So the value was unchanged—2⅞d. to 2⅞d.

Sulphate of Ammonia.

This article is very firm, and prices have advanced during the week. Export figures for the last month of the year are known to be very good indeed, more particularly so when the serious shortages in shipments to Japan are taken into account. The principal Gas Companies have done a fair business at £11 15s. for delivery between now and the end of June. They have now advanced their price up to £11 17s. 6d., and are confident that they will secure this figure at an early date. Outside makes upon Beckton terms are now selling at £11 17s. 6d., but not much stuff can be secured for prompt delivery. In Hull, £11 10s. has been paid for January; and it is reported that £11 12s. 6d. has been declined for February. In Liverpool, £11 10s. to £11 12s. 6d. has been paid; while in Leith £11 12s. 6d. was paid at the beginning of last week, and makers are now asking £11 15s. For February, £11 15s. has been paid and since refused; and for delivery all over the year, £12 is asked.

Price of Tar in the Past Year.—Reviewing the market for bye-products in the past year, the "Iron and Coal Trades Review" on Friday made the following remarks on tar: "Compared with the prices secured in January last, a fall of 4s. to 5s. per ton is indicated by closing values at the end of December. Commanding 18s. to 19s. in January, tar stood at 13s. to 14s. in July; and present quotations are nominal at 12s. to 14s. for the North and the Midlands. The depreciation is principally due to over-production and the decline in pitch values. But a turn is due; for at present rates it is argued in some quarters it can be profitably utilized as fuel—now an established fact. It seems probable that its use for preparing dustless roads will shortly absorb a quantity, as it was decided by the International Road Congress, at the meeting in Paris, to be the best material for this purpose."

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a heavier demand for coal in the last few days; and as the output has been full, the shipments have been heavy, and in a few cases the prices have advanced slightly. In the steam coal trade, some of the best collieries have sold part of their production to the end of this month; and for best Northumbrian steams, from 10s. 3d. to 10s. 4½d. f.o.b. is now the current quotation. Second-class steams vary from about 9s. 6d. to 10s., and steam smalls from 4s. 6d. to 6s. In the gas coal trade, the demand has been heavy, and there have been full shipments both to home and foreign consumers, especially on contracts. Prices of Durham gas coals vary from about 9s. to 10s. 1½d. per ton f.o.b. for the usual qualities; while for "Wear specials" up to 10s. 6d. or 10s. 9d. is the current price. Only one or two small contracts for gas coals are in the market at present; and they are not likely to affect the current values to any great extent. In coke, the general market is steady. Gas coke is plentiful, and is quoted from 13s. to 13s. 3d. per ton f.o.b.

Scotch Coal Trade.

Most of the collieries remained closed, and there was consequently almost no market last week. There are, therefore, no quotations as to prices. The shipments for the week amounted to 177,553 tons—a decrease of 111,210 tons upon the preceding week, but an increase of 58,353 tons upon the corresponding week of last year.

POCKET BOOKS, CALENDARS, &c.

Useful articles received during the past week include a neat pocket diary from the Pulsometer Engineering Company, of Reading, containing a few illustrations and particulars of their specialities. The leather cover has pockets for stamps and cards, and an opening in front for holding a railway season-ticket; and there is also included an accident insurance coupon for £1000. Another nicely bound little diary, with a similar insurance coupon, has come to hand from Messrs. Pilchers Limited, manufacturers of paints, &c., of Morgan's Lane, Tooley Street, S.E. Some information with regard to their goods is to be found in the front part of the book; and the firm also send a tint-book of Pilcher's "Perfection" paints, which are made in 69 different shades, of guaranteed quality.

Leather-bound blotting-pads have been received from Messrs. Mobberley and Perry, of Stourbridge, and the Sutherland Meter Company, of Palace Chambers, S.W., and Birmingham; and a monthly wall calendar (with a coloured illustration of a locomotive) from Messrs. Peckett and Sons, of Bristol.

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The Quality of Southport's Gas.

Over the signature of "More Light," a correspondent of the "Southport Visitor" complains about the quality of the gas supplied by the Corporation during the past fortnight, and submits that the Gas Committee are unable to cope with the demand, "as is clearly proved by the failure of the supply during the hours when the numerous places of entertainment open their doors." Mr. John Bond, the Gas Manager, when interviewed on the subject, said that the gas pressure at the works had been 28-10ths during the daytime and 32-10ths in the evening; so that there was plenty of pressure for everybody in the town. In support of this, Mr. Bond called attention to the brilliant lights at the two skating-rinks in the centre of Southport, both of which are illuminated by gas. Mr. Bond's opinion about the complaint made is that there is some defect in the fittings or burners at the residence of "More Light;" and he instanced a case which had come under his personal notice recently. On investigating a similar complaint, he found that the poor light given was owing to a meter tap being very nearly closed. When the tap had been seen to, they got for the twelve or thirteen lights in the house a splendid light. Mr. Bond's advice to consumers is like that given by Alderman Gibson, the Chairman of the Manchester Gas Committee, "Look to your fittings."

New Year's Gift to London Gas Consumers.

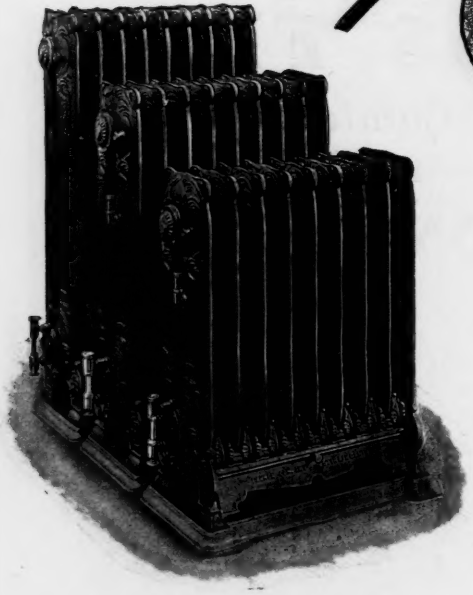
Referring, in their current issue, to the announcement made by the Gaslight and Coke Company of a reduction of 1d. per 1000 cubic feet in the price of gas as from the beginning of the year, as recorded last week (p. 37), the "Municipal Journal" characterizes it as a "welcome gift to some half-a-million of London householders." Our contemporary adds: "Gas is now so widely used in the home, not merely for lighting—in which field the economy and effectiveness of the inverted incandescent burner ensures it more than holding its own—but also as a cleanly and infinitely convenient substitute for coal, that this gradual but steady decrease in price means a great deal to a great many people. It will also undoubtedly lead to a still greater consumption of gas for fuel, both in the home and in the workshop and factory. In view of the large and growing volume of testimony from medical and scientific men to the fact that a properly-designed gas-fire, properly fixed and intelligently used, is not only not less, but is actually more, hygienic than a coal-fire (in which unpurified gas is burnt), it is not surprising that the use of gas-fires is extending very rapidly; while the cleanliness, the saving of labour, the certainty and perfect control of heat ensured by the use of gas for fuel in industrial processes are leading to the rapid displacement of all labour-requiring, dirt and ash producing fuel by the heat which is instantly obtainable by the simple turning of a tap and applying a light. The policy of reducing prices, and at the same time giving prompt and businesslike attention to every requirement of their consumers which the Gaslight and Coke Company have adopted of late years, has already proved itself to be sound, and is destined to bear even greater fruit in the future."

Loss on the Poole Water-Works.—The report on the first year's working of the Poole water undertaking shows a deficiency of upwards of £1756, which is equal to a rate of about 2½d. in the pound. The purchase price of the undertaking was £158,384; the Act cost £2522; £12,000 had to be paid in redemption of debenture stock; and the Corporation started extensions for a new supply at an expenditure of £50,000. The total capital expenditure has been more than £208,000. The Corporation's income has been about £1500 more than that of the Company, and the working expenditure was £500 less.

Public Lighting of Lambeth.—At the meeting of the Lambeth Borough Council last Thursday, the Lighting Committee reported having had under consideration the question of public lighting by inverted gas-burners. As a result, they had made an arrangement with the South Metropolitan Gas Company that, until the Committee give further instructions, whenever the erection of a new lamp is ordered in the Company's district, it shall take place in the ordinary way at the usual charges, and that, in addition, a lantern shall be removed from a column at the corner of some important street, and a new one with a No. 4 inverted burner fixed in its place. Where possible, the lantern so removed will be used for the new lamp; but, in any case, the cost to the Council will be only 3s., except where the lamp removed has only a No. 2 burner, when the cost of the lighting, &c., of the lamp will be raised from £2 9s. 2d. to £3 4s. 5d. per annum, on account of the increased consumption of gas. The action of the Committee was approved. The seal of the Council was affixed to an agreement with the Gaslight and Coke Company in regard to the automatic lighting and extinguishing of lamps in the Company's district in the borough, for a period of five years.

South Molton Water Supply.—An inquiry was held at South Molton on Thursday by Mr. P. M. Crosthwaite and Dr. L. W. Darra Mair, on behalf of the Local Government Board, respecting an application by the Town Council for power to borrow £750 for the improvement of the water-works. The Medical Officer of Health had reported that the filter-beds were inadequate and faulty in construction, and that some houses were supplied with unfiltered water. Mr. J. Siddalls, of Tiverton, who was consulted by the Corporation, recommended that two 6-feet Candy filters should be put in; and a Committee who visited Cardiff and Newport and saw this system in operation supported his opinion. The Surveyor (Mr. E. D. Groves) said the two existing filter-beds had together a surface area of 40 square yards, and were about 3 ft. 6 in. deep. When both filters were working, 2300 gallons of water per square yard passed through them daily. The Medical Officer of Health said they were really not filters though they were so called; and the Town Clerk quoted from Mr. Siddall's report to the effect that the water was rather more impure after filtration than before. Two or three members of the Town Council opposed the scheme as inadequate, and urged that they must enlarge the filters, cover the reservoirs, and relay the mains in order to provide an efficient supply of pure water to the town. The Inspectors visited the works at the close of the inquiry.

GRAND PRIX



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Heavy Sentence for Theft of Gas.—At the Middlesex Sessions, on Saturday, before Mr. Montagu Sharpe, K.C., William Thomas Russell, a carpenter, was charged with stealing 6000 cubic feet of gas, the property of the Brentford Gas Company. The accused had surreptitiously obtained his supply by tapping the service-pipe just in front of the meter; and he pleaded guilty to the offence. He was sentenced to two years' imprisonment with hard labour.

New Joint-Stock Companies.—It was mentioned last week that Messrs. Julius Norden, Limited, have commenced business as manufacturers of incandescent mantles. The Company has been registered with a capital of £2500, in £1 shares; and the first Directors are Messrs. J. Henderson, H. Kober, and Julius Norden. The Lishman and Simpson Air-Compressor Company, Limited, has been registered with a capital of £22,000, in £1 shares, to acquire the British and American patents for an air-compressor granted to Mr. T. Lishman and Mr. J. T. Simpson, of Hetton-le-Hole, Durham, and to carry into effect contracts between the vendors and Messrs. M. S. Taslakian and Co., and between the latter and the Company.

Laclede Gas Company as Santa Claus.—For the four days preceding Christmas, the Laclede Gas Company played Santa Claus to the inhabitants of St. Louis. By means of a conspicuous advertisement previously inserted in the local paper, a cordial invitation was extended to everybody to visit the principal offices of the Company; and we learn from the Superintendent of the New Business Department (Mr. John J. Burns) that it was freely accepted—the offices being quite crowded each day. The visitors received "cookies," biscuits, and wafers, prepared on a monster rotary baking-oven, gas-mantles, aluminium-tip burners, and holly "button-holes." The Company had 48 of their miniature "Mother's" gas-range on sale at an exceptionally low figure for presents.

Gas Explosion and Fire near Bromley.—Early on Monday morning last week a destructive fire, caused, it is supposed, by an explosion of gas, occurred at Pickhurst Mead, Hayes, near Bromley (Kent), the residence of Mr. Huntley Walker. It appears that some days previously the inmates of the house were conscious of an escape of gas, and endeavours had been made to locate it, but without success. When the household, with the exception of Mr. Walker, retired on the Sunday night, everything was apparently safe; but just before five o'clock next morning a police-constable on duty in the neighbourhood heard the noise of an explosion, and on hastening in the direction whence the sound proceeded, he found the mansion in flames. The occupants were rescued, and the flames eventually extinguished; but not before damage to the extent of about £30,000 had been done. At the time of the explosion, Mr. Walker was in the gardener's cottage, where he had gone with the butler, it is stated, to cut off the gas.

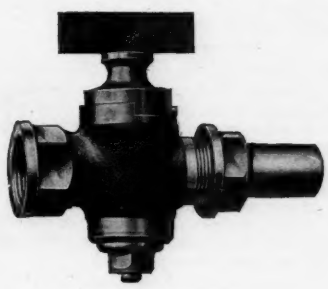
Salford Electricity Committee's Smoke Nuisance.—A fine of 5s. and costs has been imposed upon the Salford Electricity Committee by the Stipendiary Magistrate (and an order for abatement made) for allowing black smoke to be emitted from the chimney at their works. An inspector of the Health Department stated that the occupiers of other works in the vicinity had pointed out that they were being accused of similar offences, and that the Electricity Department ought to be proceeded against as well. Mr. M. Cowan, the Electrical Engineer, said there were exceptional circumstances in the emission of the smoke on the two occasions referred to. In one instance, they were testing coal; and in the other, one of the economizers broke down. The Magistrate said the Corporation had done their duty in prosecuting. Salford was entitled to a pure atmosphere, or as pure as possible; and if it was said that the Electricity Department had done all they could to obviate the nuisance, there was still the fact that an offence had been committed.

The Aldershot District Council and the Gas and Water Company's Bill.—The Aldershot Urban District Council have not yet come to a decision as to the action to be taken concerning the proposed application of the Gas and Water Company to Parliament for the extension of their own works and power to purchase others in neighbouring districts. The "Aldershot News" understands that the Council generally are anxious to avoid any hindrance to the plans of the Company; realizing as they do that the expansion of the enterprise must result in the provision of a considerable amount of employment for men—at present Aldershot's most urgent need. It is pointed out that in the work of extending the Company's undertaking, and in carrying on the increased business afterwards, a considerable number of weekly wage earners must be employed; thus benefiting not only those needing employment but traders, who reap considerable advantage by the class of custom represented by the spending power of a considerable number of weekly wage earners. The rates of the town would benefit by the addition to the rateable value, and a demand for houses would result. For these reasons and others, our local contemporary would "extremely regret any action on the part of the Council that would frustrate or delay the success of the Gas Company's enterprise, which is altogether in the interests of Aldershot."

A Satisfactory Position at Bilston.—The report adopted at the annual meeting of the Bilston Gas Company last week stated that the profit and loss account, after payment of the usual interim dividends, showed a credit balance of £8478. It was proposed to pay further dividends of 5s. 6d. on the "A" shares and 4s. on the "B" shares—making 11s. and 8s. per share respectively for the year, and leaving a balance of £5793. The Directors have now under consideration estimates for part of a scheme of renewal of portions of the existing plant, which will entail an expenditure on this section of the scheme of approximately £1500. The other portions will be dealt with at an early date. The Chairman (Mr. H. Holcroft) said he thought they might congratulate themselves on the generally satisfactory position of the Company. During the year they had had to pay £1307 more for coal, in consequence of the higher prices ruling; but the Directors had not increased the price of gas. If the miners' hours were reduced, it would be a bad thing for gas companies, and, indeed, for all coal consumers. He found that the sympathy which was shown by the public towards the Eight Hours Bill arose mainly through their profound ignorance as to the conditions of the miner's life. The sales of gas showed a slight increase; and the one unsatisfactory feature of the accounts was the item of rates.

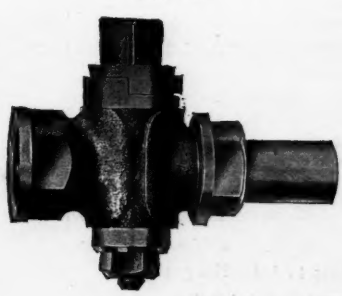
MAIN TAPS

No. 119.



ROUND GASWAY.

No. 61.



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Suicide by Gas at Brighouse.—William Bentley, a Brighouse blacksmith, aged 66, has committed suicide by inhaling gas from a tube, one end of which was attached to an open gas-bracket. Owing to ill-health, he had not worked for four years; and he had often been heard to express the wish that he was dead.

Eye Town Council and the Bungay Water Bill.—A special meeting of the Eye Town Council was held last Wednesday to consider the provisions of the Bungay Water Bill as affecting the borough, which it is proposed to include in the area to be supplied under the Bill. The Mayor (Dr. Edgar Barnes) presided, and explained the object of the Bill. He reminded the members that last year they were approached by Mr. Preston, asking that he should be allowed to establish water-works in the town; but they did not accept the proposition. Since then he had promoted the present Bill, which proposed water supplies not only for Eye, but for Bungay, Harleston, and other places. Many of the things promised last year would be found in the Bill; but there were some minor differences which were not incorporated. He thought, in view of the condition of the water supply of the town, the scheme now proposed was necessary; and certainly the Corporation could not carry it out so cheaply as could Mr. Preston. They would incur a loss while he would make a profit. After carefully considering the question, he thought the Corporation would not be justified in opposing the Bill. He suggested that a Committee should be appointed to try to obtain such modifications in the Bill as would meet their wishes. The suggestion was embodied in a resolution, and carried unanimously.

The Gas Collector to the Barry Urban District Council (Mr. T. W. Lewis) recently submitted an interesting report showing the growth of the prepayment system of gas supply in the town. It stated that in 1900 there were 2560 slot-meters in use, whereas at present there were 4500; the revenue in 1900 being £5438, while now it is £10,935.

Messrs. Stewarts and Lloyds, Limited, send from Nile Street, Birmingham, a copy of a small catalogue which they have just issued. The size is a most convenient one for pocket or desk purposes; and the tubes, joints, valves, fittings, &c., which are illustrated, described, and priced cover such a wide range that the book is one which gas and water people will like to keep handy.

A slight fire occurred at the Goole Gas-Works last Tuesday afternoon, owing to a seal-pot in the vicinity of the retort-house blowing. The escaping gas was ignited by a barrow of hot coke which was being wheeled from the retort-house; the flames destroying a little woodwork on the engine-house corner. The outbreak was very trifling indeed, and was extinguished in a little over half-an-hour.

A Local Government Board inquiry has been held at Rhyl, with regard to an application by the Urban District Council for sanction to borrow £4213 for extending the gas-works—which course has been rendered necessary by the great increase in the demand for gas. There was no opposition.

The Leading Light Syndicate, of Hull, have recently completed a large installation of acetylene in Lincolnshire; 22 houses having been fitted up on the penny-in-the-slot system, and the consumers receiving 2 cubic feet of acetylene for 1d. The whole of the houses are supplied from one central plant, and the number of lights is 176. The meters (wet), which have been supplied by Messrs. Parkinson and W. & B. Cowan, are reported as working splendidly; and the installation gives all-round satisfaction.

The Block Light Company (1908), of Milk Street, Manchester, who a few months ago purchased from the Receiver the goodwill, patents, &c., of Block Light Limited, have since been busily engaged in organizing the business; and they have now issued a complete illustrated catalogue of their burners, mantles, and accessories. The Company have, we understand, succeeded in making satisfactory arrangements for a continuous supply of all the specialities in Block Light burners and mantles to fill the demand.

Some alterations and additions to the Manchester Coal Exchange, including a new café, have lately been carried out by a Sub-Committee of which Mr. James Roscoe was a prominent member; and at the inaugural ceremony on Monday last week he was specially complimented on the result of his labours. In acknowledging a vote of thanks to the Sub-Committee, Mr. Roscoe said they would be amply repaid for their trouble if they had succeeded in making the members more comfortable in the discharge of their business.

The Directors of the Power-Gas Corporation state in their report that the works of Messrs. Ashmore, Benson, Pease, and Co., Limited, at Stockton-on-Tees, have been maintained in a condition of efficiency and repair, and that all expenditure for this purpose has been charged to revenue. The business has suffered from the strike on the north-east coast, which affected a portion of the works, and extended over the larger part of the financial year. This fact, combined with the general depression in trade, has led to a diminished turnover and profit. As compared with a loss of £2929 in the previous year, the result of the past financial year's trading shows a profit of £2407, to which has to be added £253 brought forward; making altogether £2660, which the Directors propose to carry forward. They have acquired the suction-gas producer business of the Mersey Engine and Producer Company, Limited, and are satisfied with the progress made in developing this branch.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT ENGINEER AND MANAGER. Swansea Gaslight Company. Applications by Jan 21.
WORKING MANAGER. Towyn, Merioneth. Applications by Jan. 20.
GAS HEATED WATER HEATER EXPERT. No. 5042.
WORKING FOREMAN. No. 5041.

Situations Wanted.

ASSISTANT-MANAGER. E. Sainter, Gas Works, Longwood.
CONFIDENTIAL POST BY RETIRED LONDON WATER OFFICER. No. 5043.
REPRESENTATIVE (GAS STOVE AND METER TRADE). G. Mills, Newcastle-on-Tyne.
SECRETARY AND MANAGER (WATER-WORKS). No. 5040.

Factory Premises to Let. No. 5038,

Plant, &c. (Second-Hand), for Sale.

ASCENSION PIPES, MOUTHPIECES, &c. Swinton Gas Company.
METERS. The Gaslight and Coke Company.

Plant, &c. (Second-Hand), Wanted.

CONDENSERS, STATION METER, AND GOVERNOR. Water Works, Lighting and Power Investment Corporation.

Stocks and Shares.

DRAYCOTT GAS COMPANY. Jan. 27.
NORTH MIDDLESEX GAS COMPANY. Jan. 19.
PORTSMOUTH WATER COMPANY. Jan. 21.
SOUTHEND WATER COMPANY. Jan. 19.
SOUTHGATE AND DISTRICT GAS COMPANY. Jan. 19.
YARMOUTH WATER COMPANY. Feb. 2.

TENDERS FOR

Coal Breaker and Elevator.
SOUTHEND GAS COMPANY. Tenders by Jan. 25.

Condensers.
SOUTHEND GAS COMPANY Tenders by Jan. 25.

Exhausters.
BEAUFORT GAS, &c., COMPANY.

Fire-Clay Goods.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 19.

Gasholder and Tank (New) and Repairs to Gasholder.
BEAUFORT GAS, &c., COMPANY.

Governors.
BEAUFORT GAS COMPANY.

Iron and Steel Works.
SOUTHEND GAS COMPANY. Tenders by Jan. 25.

Lighting Contract.
TOURNAY (BELGIUM). Tenders by Feb. 1.

Mantles, &c.
PLYMOUTH LIGHTING DEPARTMENT. Tenders by Jan. 30.

Meters.
BEAUFORT GAS, &c., COMPANY.

Pipes and Pipe Laying and Jointing.
BEAUFORT GAS, &c., COMPANY.
RAWMARSH GAS DEPARTMENT. Tenders by Jan. 18.

Purifiers.
BEAUFORT GAS, &c., COMPANY.

Retort Bench, Ironwork, &c.
BEAUFORT GAS, &c., COMPANY.

Slot Installations.
BEAUFORT GAS, &c., COMPANY.

Tar and Liquor.
TODMORDEN GAS DEPARTMENT. Tenders by Jan. 15.

Washing and Scrubbing Plant.
BEAUFORT GAS, &c., COMPANY.
MATLOCK BATH AND SCARTHIN NICK GAS DEPARTMENT.

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